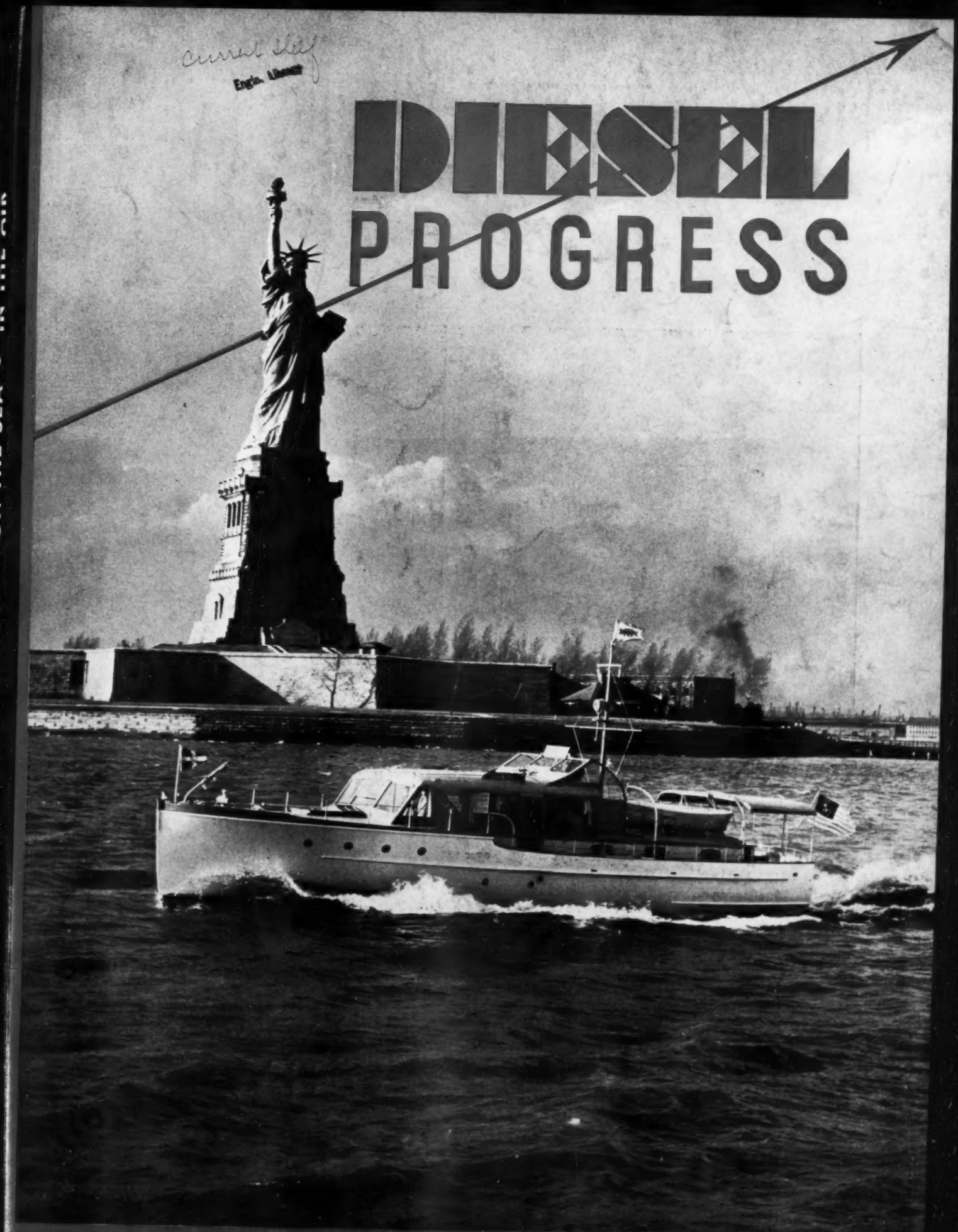

MAY, 1939 CIRCULATION OF THIS ISSUE—IN EXCESS OF 14,000 COPIES 25c

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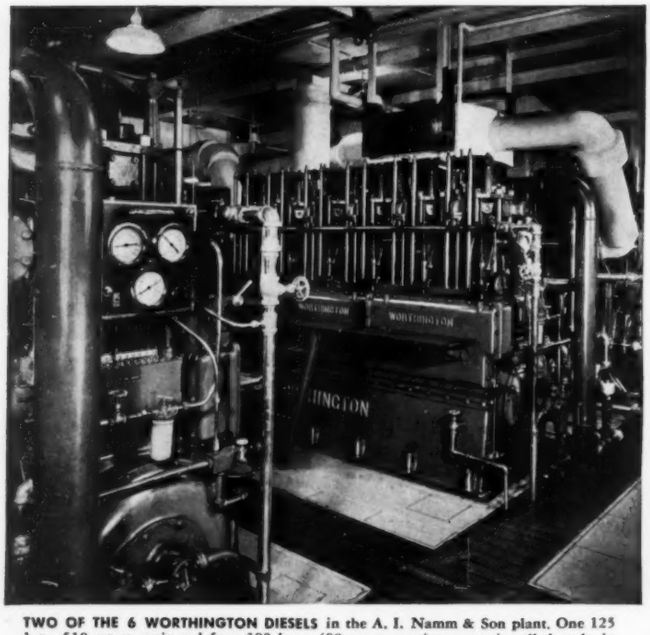
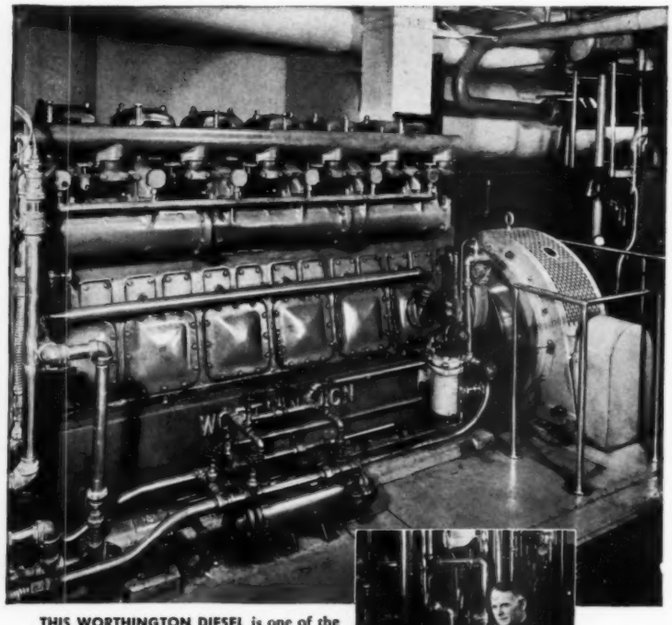


TWO OF THE 6 WORTHINGTON DIESELS in the A. I. Namm & Son plant. One 125 h.p., 510 r.p.m. unit and four 300 h.p., 400 r.p.m. engines were installed early in 1936. Another 150 h.p., 600 r.p.m. Worthington has been in service about a year. All are Texaco lubricated.



THIS WORTHINGTON DIESEL is one of the six. Performance has been excellent. Engines are cleaner, more efficient since lubricated with Texaco.

CHIEF ENGINEER HARRY WAITE, since changing to Texaco in December 1936, reports definite reduction in carbon formation in cylinders and on pistons. Sticking rings have been eliminated.

IT'S THE PLANT OF A. I. NAMM & SON, Brooklyn, N. Y., Harry Waite, Chief Engineer.

Today Mr. Waite is getting an additional 1,000 hours of service between piston inspections.

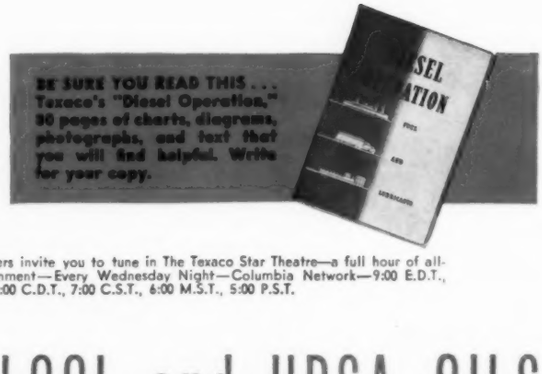
This great improvement is one result of changing over to Texaco Algol and Ursa Oils.

Another improvement from the use of Texaco in this plant was an increase in time between crankcase cleanings.

Experiences such as this, repeated many times over, show why more stationary Diesel h.p. in the United States is lubricated with Texaco than with any other brand.

To get Texaco Perfected Lubrication in *your* plant, phone the nearest of our 2229 warehouses. Trained engineers will help you in the selection and use of Texaco Algol and Ursa Oils.

The Texas Company, 135 East 42nd Street, New York City.



Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment—Every Wednesday Night—Columbia Network—9:00 E.D.T., 8:00 E.S.T., 8:00 C.D.T., 7:00 C.S.T., 6:00 M.S.T., 5:00 P.S.T.

TEXACO

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PERFECTED LUBRICATION FOR DIESELS

DIESEL PROGRESS for May, 1939. Volume V, No. 5. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at Brooklyn, New York, authorized May 14, 1935. Subscription rates: United States and Possessions $3.00. Canada and all other countries $5.00 per year. Single copy price 25 cents in U. S. A., 50 cents for all other countries.

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CCA

REX W. WADMAN
Editor and Publisher

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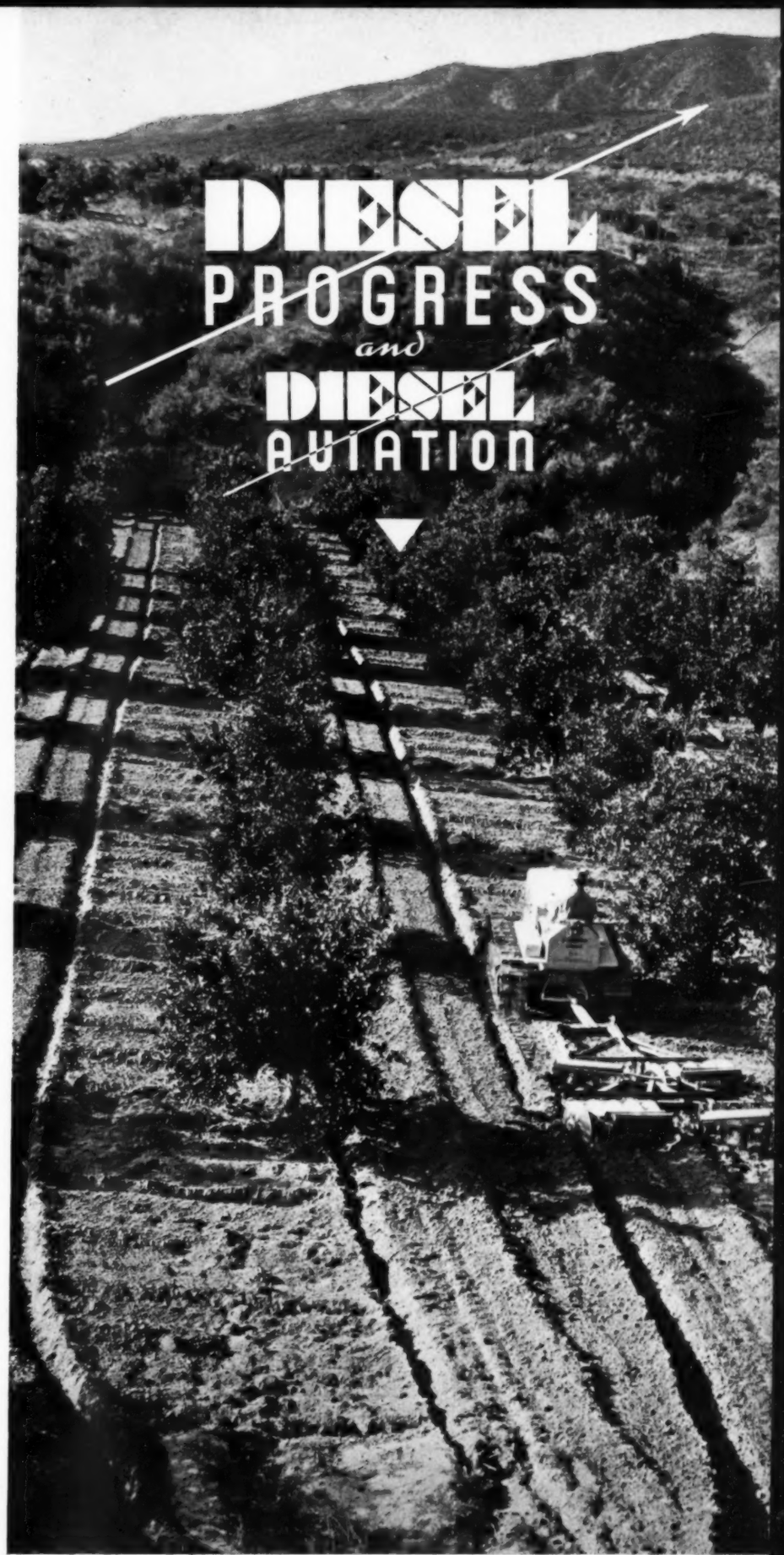
HEYWORTH CAMPBELL
Art Director

PAUL H. WILKINSON
Aviation Editor



U. S. Coast Guard Ice-Breaker "Naugatuck" making her trials in ice on Saginaw Bay.

COAST GUARD ICE-BREAKERS

By REX W. WADMAN

AMPLE evidence of the splendid performance to be expected of the new General Motors Diesel-powered ice-breakers built by the Defoe Boat and Motor Works, of Bay City, Mich., was furnished Coast Guard officials when conditions as severe as any likely to be met in actual service were encountered during the trials of the vessels in Saginaw Bay.

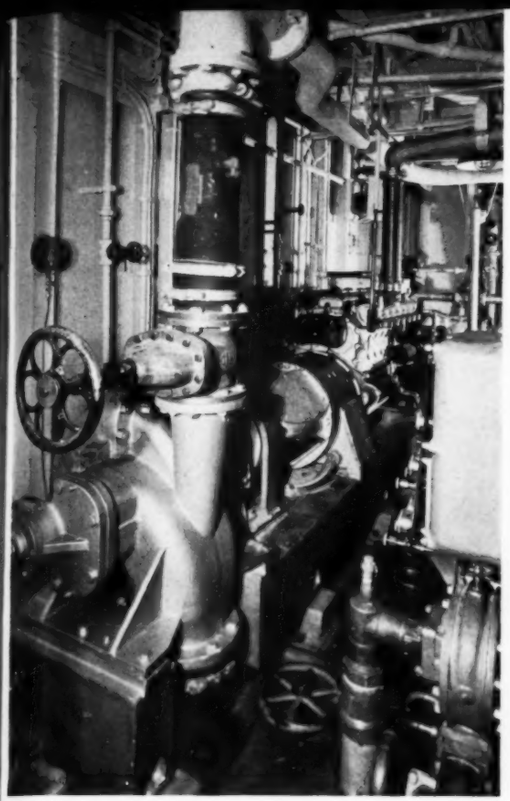
Living up to the motto of the service, "Semper Paratus," the 110-foot harbor cutter *Naugatuck* her first day out enabled two tankers to reach the Michigan port in safety by cutting a swath through a field of solid ice that had entrapped them. The ships, the S.S. *Panoil* and the S.S. *Mexoil,* were seeking to open the navigation season on Lake Huron. The ice, extending across the mouth of the Bay a distance of 24 miles, was more than 6 miles in width and from 6 to 15 in. thick. The tankers had made approximately 3 miles through the field in 24 hours, and were practically at a standstill when the *Naugatuck* reached them.

Those aboard the cutter were obviously impressed by her performance. They commented particularly upon the fact that the thickest of the ice slowed her down only to about half speed, and that it was unnecessary as with vessels currently in service to back in order to gain momentum after coming to a stop. In open water, the *Naugatuck* showed a maximum speed of 15.3 mph.

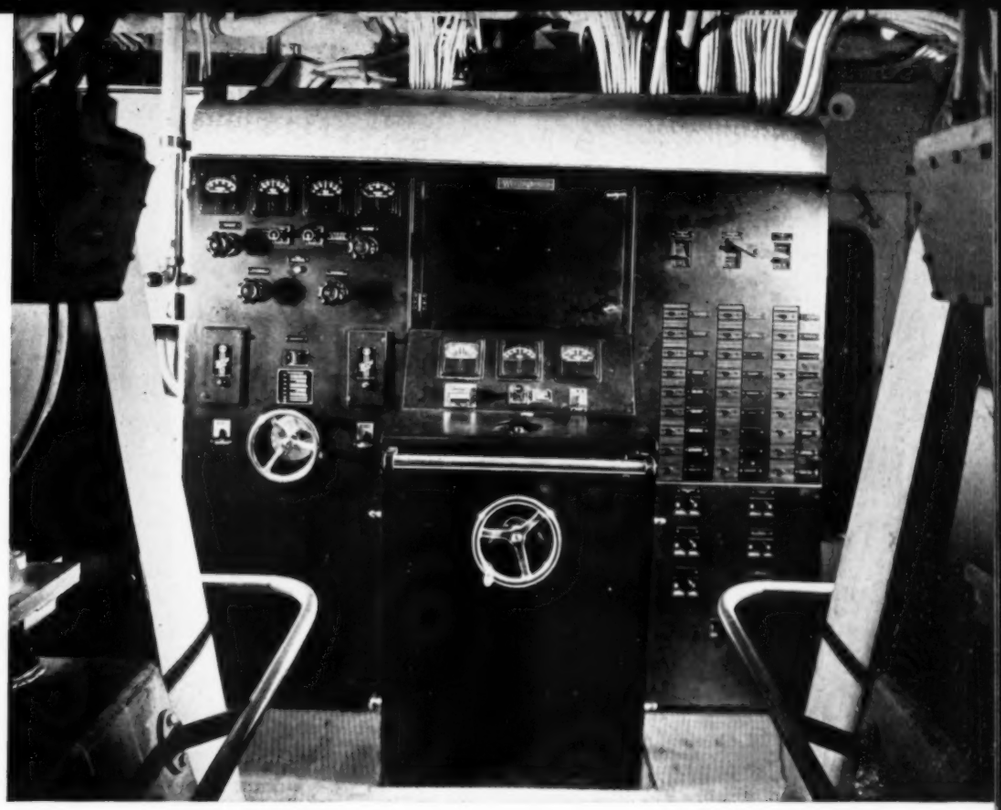
It was the original intention to send both cutters out the following day, one of the tests scheduled being a "tug-of-war" between them, with the engines of one turning up sufficiently to drive her about 4 mph., those of the other operating at full speed. This plan was abandoned after the rescue of the tankers. More, it was agreed, had been learned concerning the cutter in one day than would be possible under ordinary conditions in the next six or eight months.

Instead, the *Raritan,* sister ship of the *Naugatuck,* went out alone. With similar conditions prevailing, she opened a path to open water in Lake Huron so the tankers might leave for Cleveland with a cargo of crude oil taken aboard overnight at Bay City, then returned to the upper end of the Bay where she went through her speed trials, figure eight turns and other required maneuvers.

Like two other harbor cutters of similar de-



General Motors Model 6-71 auxiliary generator set with clutch-driven fire pump.



Engine room operating desk and panel, also auxiliary power and distributing panel.

sign now building at the Gulfport Boiler and Welding Works, Port Arthur, Texas, the *Naugatuck* and *Raritan* are each powered with two 8-cylinder, V-type General Motors 2-cycle Diesel engines, direct-connected to direct current generators. These supply electrical energy to the main propulsion motor, which drives the single screw. All electrical equipment is Westinghouse.

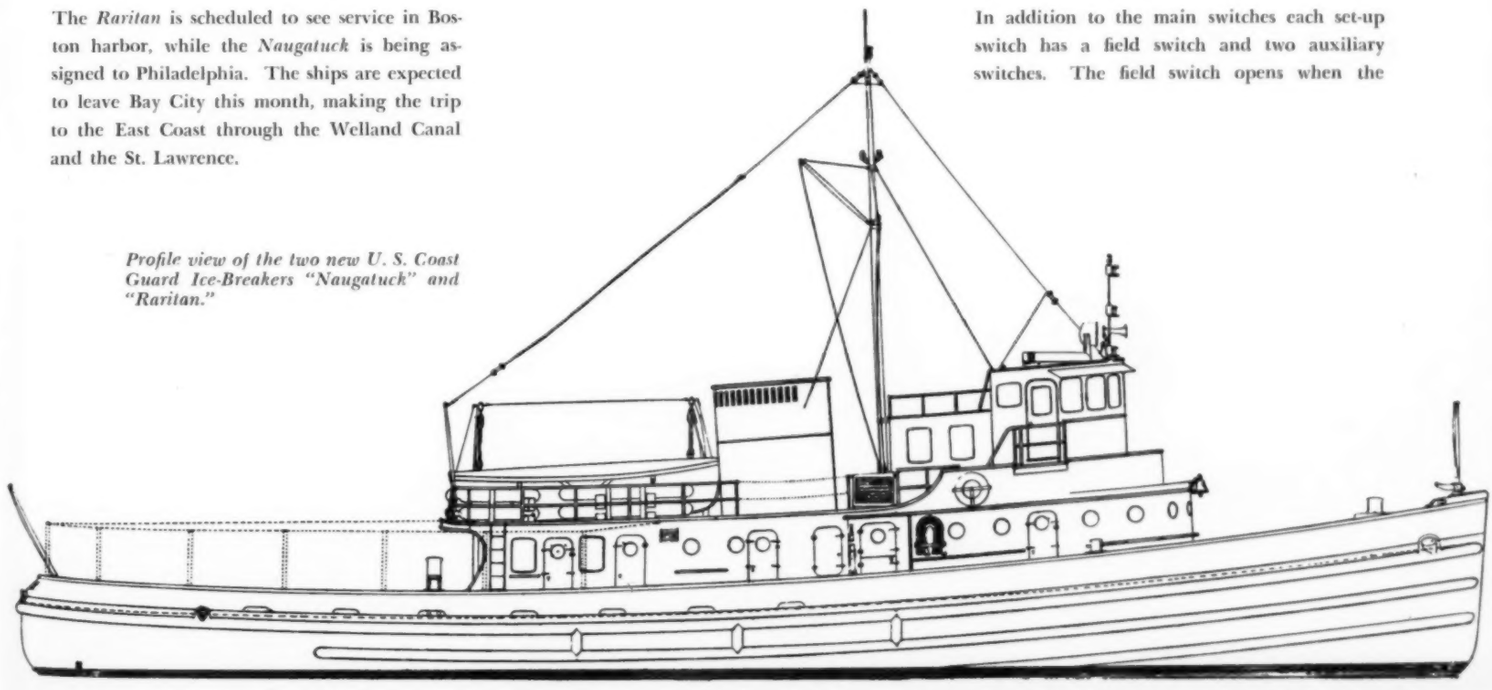
Installed in each vessel for auxiliary power is a General Motors 6-cylinder, 2-cycle Diesel of the small, or 71, series. This is direct-connected to a 30 kw. generator and a clutch-driven fire pump. The equipment also includes a 15 kw. motor generator stand-by set for use in port.

The *Raritan* is scheduled to see service in Boston harbor, while the *Naugatuck* is being assigned to Philadelphia. The ships are expected to leave Bay City this month, making the trip to the East Coast through the Welland Canal and the St. Lawrence.

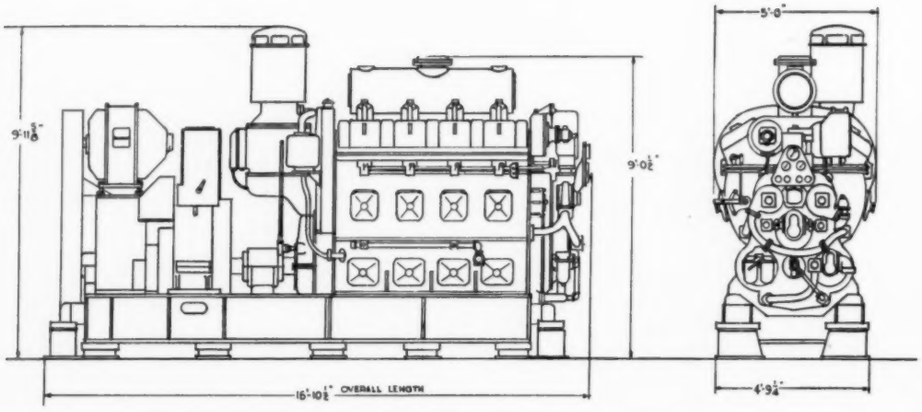
These harbor cutters are for use as boarding tugs and for ice breaking in harbors, rivers, sounds, and bays. For the first mentioned duty, 800 shp. at 250 rpm. is required at the propeller shaft, and for the second duty 1,000 shp. at 235 rpm. Diesel-electric drive provides the flexibility in maneuvering required. Operation of the vessels may be controlled either from the pilot house or engine room. Propeller speeds up to 200 rpm. are obtained in the first six controller positions with the engines operating at half speed. Higher speeds up to full power are obtained by increased engine speeds and variations of motor field current over the remaining five steps.

Either of the main generators can be disconnected from the motor circuit by means of cam-operated switches, mounted in drip-proof enclosures directly on the frames of the generators. The operating levers are mounted on the outside of the enclosures to permit operation without removing the covers. Each set-up group has three main contacts for the respective generators. With both set-up switches in the "in" position, both generator armatures are connected in series with the motor armature for this set-up. With one of the set-up switches in the "out" position, one generator armature is removed from the circuit, while the other supplies the power to the motor.

In addition to the main switches each set-up switch has a field switch and two auxiliary switches. The field switch opens when the



Profile view of the two new U. S. Coast Guard Ice-Breakers "Naugatuck" and "Raritan."



Dimensional drawing of General Motors main engines showing Hussman spring mountings which are used not only under the main engines, but also under the auxiliary engine.

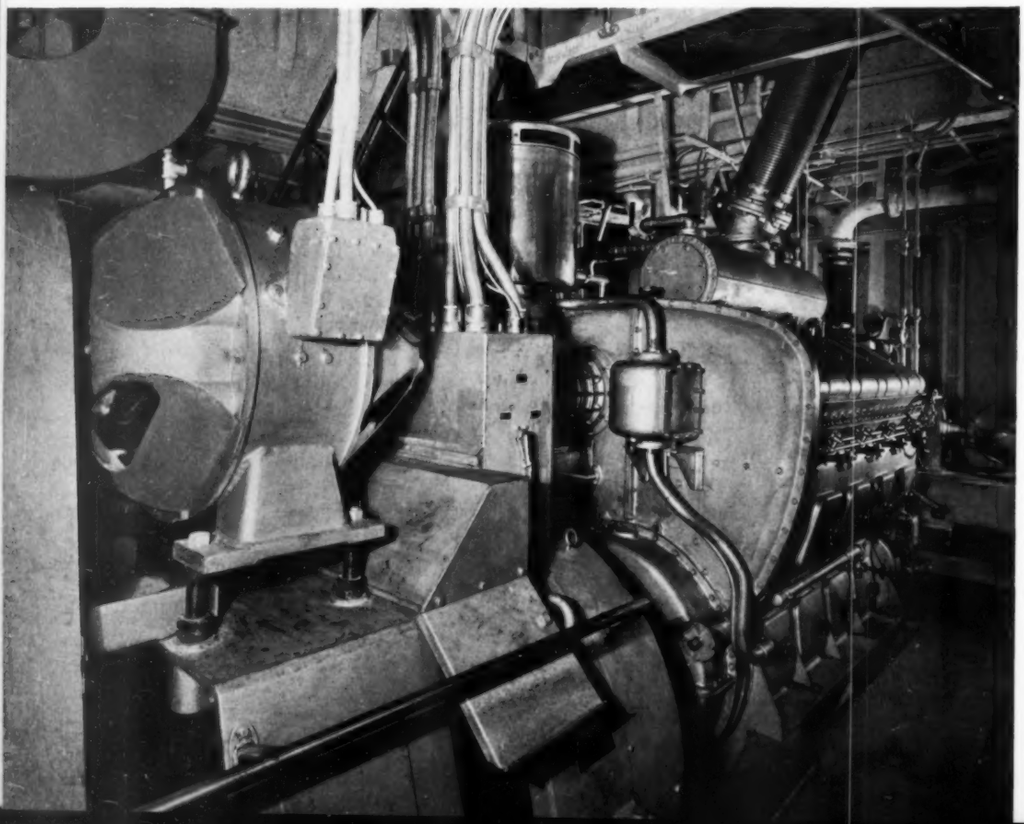
set-up switch is moved to the "out" position and disconnects the generator field from the excitation bus. The corresponding auxiliary switch closes and permits energizing of the engine starting contactors. The other auxiliary switch opens and de-energizes motor field contactor. A resistor is thereby inserted in series with the motor field. The resistor is selected to give a motor field current, which permits the motor to absorb the maximum power of the main engine, when only one engine is being used for propulsion.

A latch is provided on the switch camshaft which prevents turning of the camshaft unless the latch has been released by pressing a release lever located close to the switch operating lever. An interlock switch thereby opens and de-energizes the main field contactor, which in turn de-energizes the generator fields. This is done to prevent accidental operation of the set-up switches with voltage on the generator.

The speed of the motor is controlled by means of a cam controller which is designed to give 11 speed points in each direction. The speed controller, which is located in the engine room control desk, can be operated by hand by means of a hand-wheel at front of the desk. In addition, the speed controller is provided with a motor-operating mechanism from remote control from a master speed controller, located under the pilot house desk, and mechanically connected to two operating pedestals in the pilot house.

On the first six points of the speed controller, variation in the motor speed is obtained by maintaining a constant motor field current and by changing the generator field current from zero to the "stop" position to a maximum in the sixth position while the engines run at half speed (375 rpm.). For this purpose the speed controller is provided with 14 field switches. Of these switches four serve to reverse the generator fields, five serve to change the generator field currents, while the purpose of the remaining five switches is to vary the motor field current.

In the "stop" position of the speed controller all the field switches are open and the generator field de-energized. The generator voltage is practically zero and the main motor is at standstill. With the speed controller in the first position "ahead," two of the field switches close and the two generator fields are connected across the excitation bus with field resistor in the circuit. This resistance is selected to give a generator voltage corresponding to a motor speed of approximately 38 rpm., and a power output of approximately 20 hp. Resistance in the motor field circuit is selected so that, in the sixth position, with the engines



One of the two General Motors two-cycle main engines with direct-connected Westinghouse generator and belt-driven exciter. Note Harrison heat exchanger mounted to the right of blower.

U. S. Coast Guard Ice-Breaker "Naugatuck" on her trial trip.

running at 375 rpm., and with maximum generator field current, the motor speed will be 200 rpm., with an output of 345 hp.

From the first to sixth speed controller points field switches close in rotation, thereby gradually shorting out the generator field resistance and increasing the generator field current and voltage, until a maximum is reached on the sixth point.

From the speed controller point six and on up to the eleventh point further speed variation is obtained by maintaining maximum generator field and increasing the engine speed. Four auxiliary switches on the speed controller serve to control the throttle operator. At the same time the motor field is being gradually increased by successive closing of motor field contactors. Resistor steps in the field circuit are selected in such a manner that the motor will absorb practically the full available power output of the engines at the different speeds.

The approximate values of engine speed and brake horsepower and the corresponding values of motor speed and ship horsepower are:

Controller Position	*Engine rpm.*	*Engine bhp.*	*Motor rpm.*	*Ship hp.*
7	428	305	220	455
8	540	388	240	615
9	670	487	250	800
10	720	541	242	900
11	750	598	235	1,000

The tenth and eleventh points on the speed controller are used only for towing or ice breaking. For normal free running the highest speed is obtained on the ninth point.

The speed controller can be manually operated by means of a hand-wheel on front of the engine room operating desk, but normally, the controller is operated by remote control from the pilot house master controller. When it is desired to change to pilot house control it is only necessary to place the operating handle of a control transfer switch on the operating desk in "Pilot House" position, thereby energizing the pilot motor and the follow-up circuits.

The camshaft of the speed controller is driven by a shunt wound DC motor through a spur gear train and a Geneva gear. The gear ratio is such that it requires approximately .5 second to move the camshaft one step.

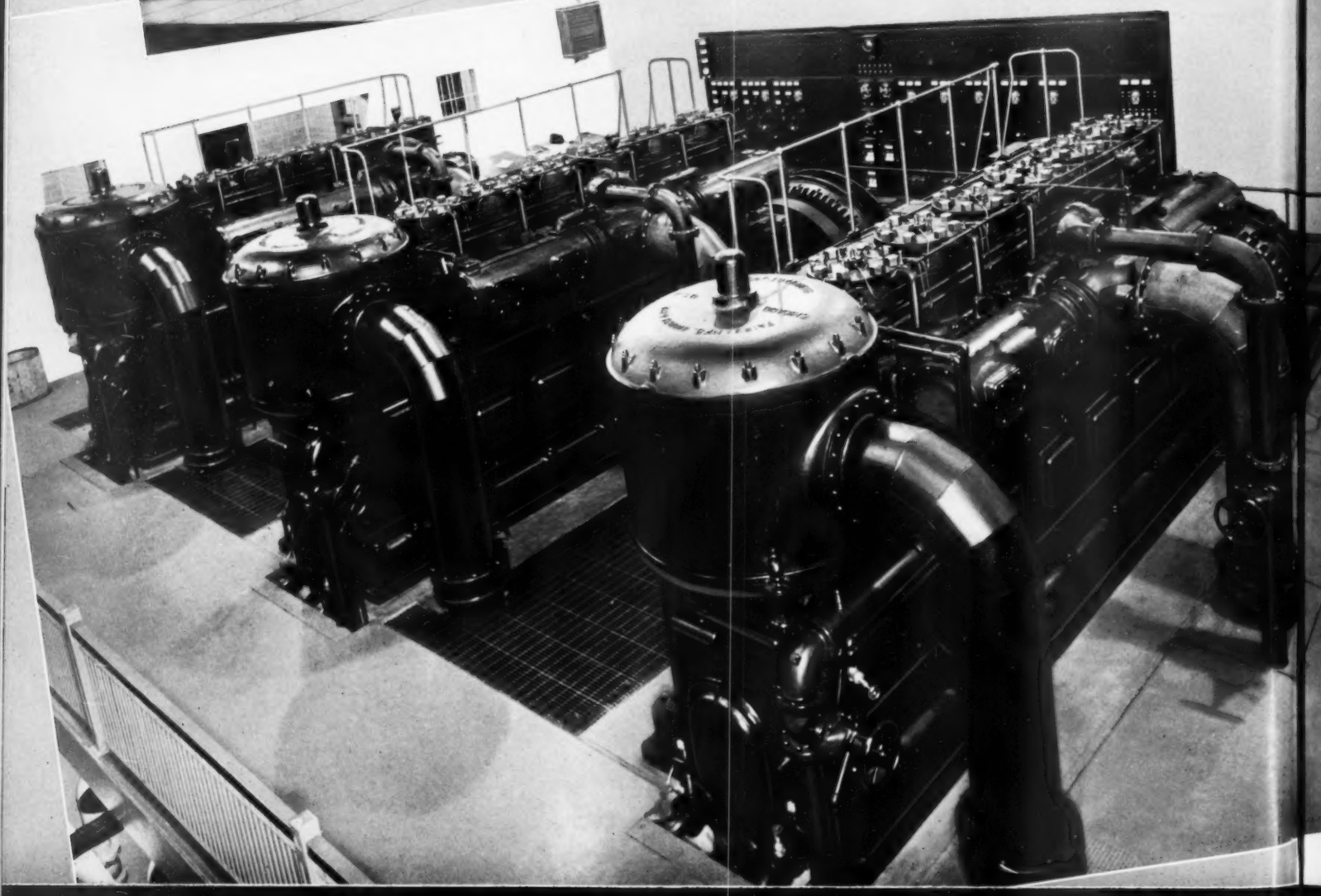
The master controller in the pilot house has 10 cam-operated switches. To obtain the proper follow-up of the speed controller, this is provided with 18 cam-operated follow-up switches.

The voltage of the two exciters is regulated within plus or minus 3 per cent of 120 volts by means of "Silverstat" voltage regulators, located in the engine room control stand. One regulator for each belt-driven variable speed exciter is furnished.

The regulator coil is connected in series with a resistor and a small adjusting rheostat across the exciter armature. An iron magnetic circuit in the shape of a square "C" passes through and mounts the regulator coil. A movable arm is mounted so that the armature attached to its lower end can move against the pull of a spring in the air gap of the magnetic circuit. Thus any change in exciter voltage correspondingly changes magnetizing effect of the coil on magnetic circuit and will cause armature and moving arm to change position.

(Left) Exterior view of the new Jacksonville Power Plant Bldg. The plant and distribution system were designed and engineered by the firm of Warren & Van Praag, consulting engineers of Decatur, Illinois.

(Below) Three F-M Diesel Engines drive three F-M alternators in the Jacksonville, Ill. municipal plant. Total horsepower, 1925. Total generating capacity, 1351 kw. Inset shows view of plant building.



FAIRBANKS MORSE

DIESEL ENGINES ELECTRICAL MACHINERY RAILROAD EQUIPMENT WASHERS-IRONERS STOKERS
PUMPS FAIRBANKS SCALES WATER SYSTEMS FARM EQUIPMENT AIR CONDITIONERS

New JACKSONVILLE MUNICIPAL PLANT Reduces Rates 25%

Chooses Fairbanks-Morse Diesels, Generators, Motors, Pumps for New Municipally Owned Power Plant

Court Decision Opens Way to Municipal Ownership for Many Other Illinois Cities

A FEW months ago when Jacksonville, Illinois began to generate its own power with Fairbanks-Morse Diesel Engines, the citizens realized the hopes of many years—and the court order which made this municipal plant possible also cleared the way for many other communities of Illinois to own and operate their own power plants.

The city council of Jacksonville passed the necessary ordinances for municipal ownership back in 1935 and 1936. Then followed numerous actions and injunctions in state and federal courts. In April, 1937, however, the Supreme Court of Illinois unanimously approved the validity of Jacksonville's municipal plant. And the Duke and Alabama Cases cleared up all federal questions.

Formal contracts for the Jacksonville plant were signed on May 13, 1938. Construction started the same day. Within nine months Jacksonville was generating its own current. On February 2, 1939 the plant was lighting city streets—and the city announced new low rates and began servicing customers.

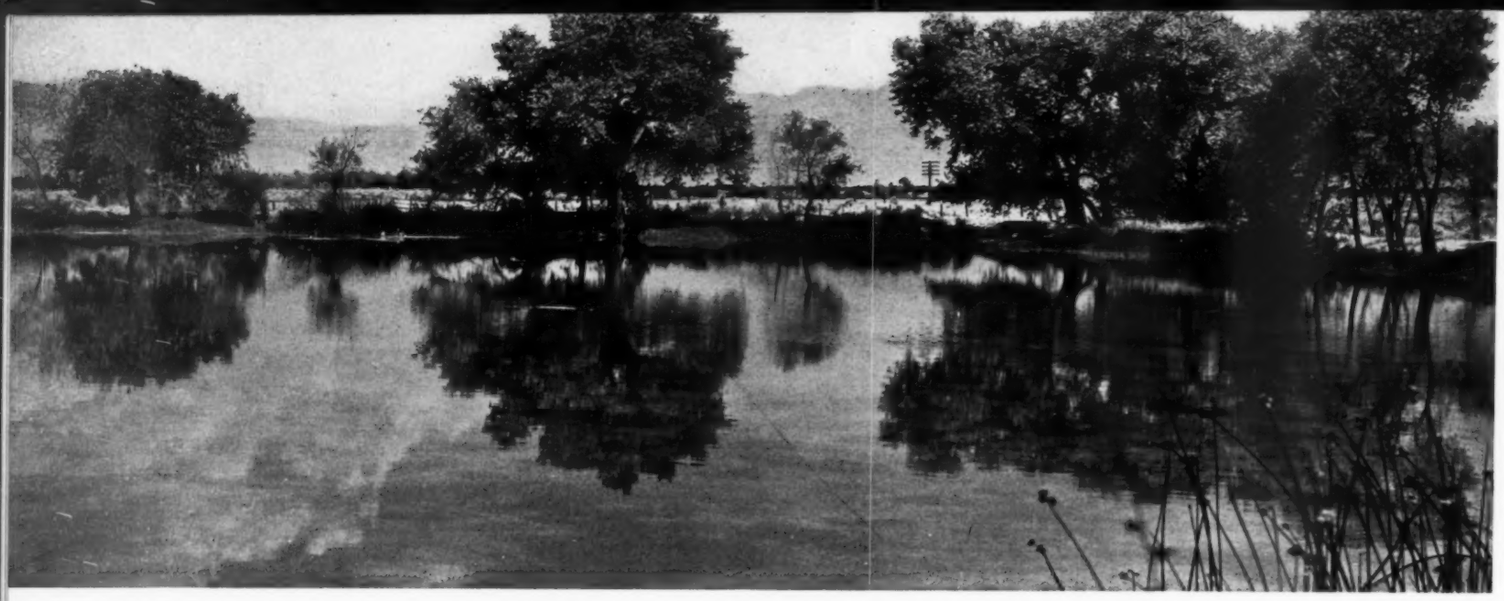
At the very beginning these rates represented a reduction of 25 per cent! New connections were soon being made at the rate of 30 per day.

General contract for the Jacksonville plant and machinery was handled by Fairbanks-Morse. The main generating units consist of two 1050-hp. 6-cylinder 16″ x 20″ Model 33D16 Fairbanks-Morse Diesels (direct-connected to F-M 739-kw. alternators) and one 875-hp. 5-cylinder 16″x 20″ Model 33D16 F-M Diesel (direct-connected to a 612-kw. alternator). Raw water for the cooling system is circulated by three 10-hp. F-M motors driving F-M Fig. 5811 bronze-fitted, double suction, ball-bearing centrifugal pumps, each with capacity of more than 500 g.p.m.

The entire plant with its safety devices and provisions for economical operation represents the last word in central station equipment and furnishes another striking example of the kind of engineering service that Fairbanks-Morse renders. Fairbanks, Morse & Co., Dept 23, 600 S. Michigan Ave., Chicago. Branches and service stations throughout the United States and Canada.

2013-OA40.157

Diesels



The water reservoir, Hesperia, California, a village on the Mojave Desert.

CATERPILLAR AT THE MOJAVE DESERT

By GEORGE D. CROSSLEY

THE endangered lives of the village of Hesperia, located on the Mojave Desert, 100 miles northeast of Los Angeles, California, were saved by a Caterpillar Diesel engine. This village depends upon its natural water supply for its existence.

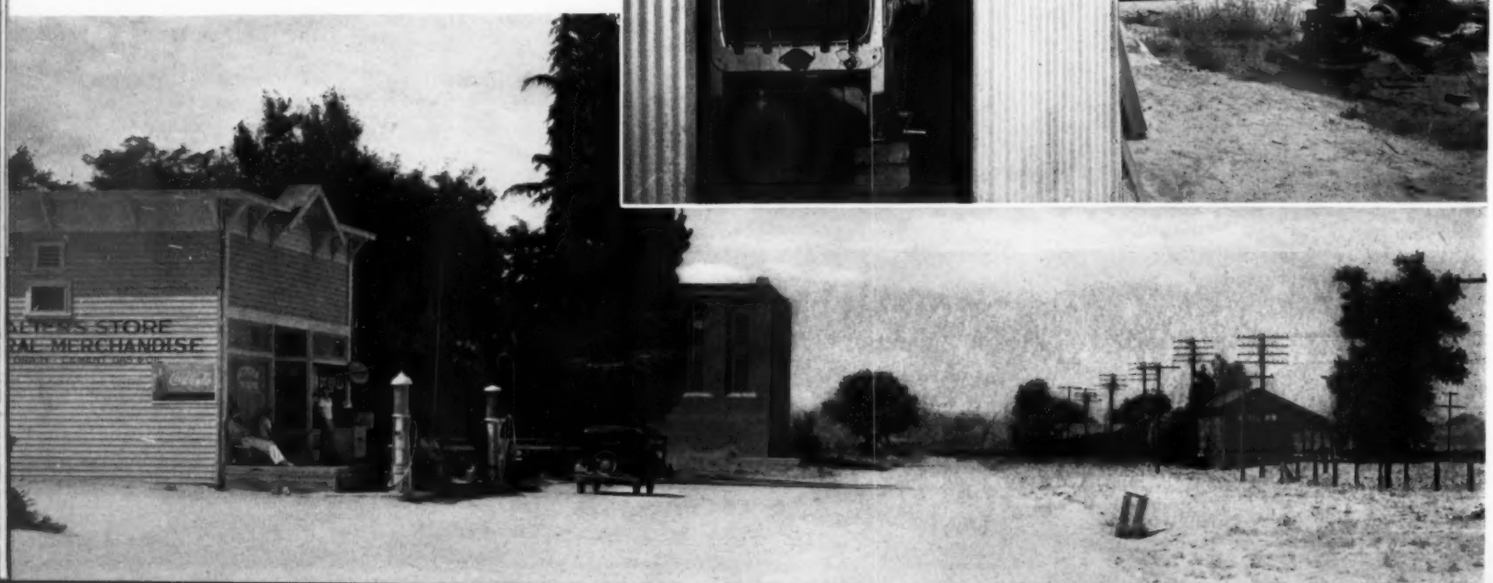
The water reservoir, located four miles away from the village proper, is fed by a canal with the water provided from springs and streams. Last year, when unusual rainfalls occurred. the water ran down the hillsides and went off in cloudburst proportions, sweeping away the canal so that no water could reach the reservoir, thus leaving the homes and stores of the village without a supply of water.

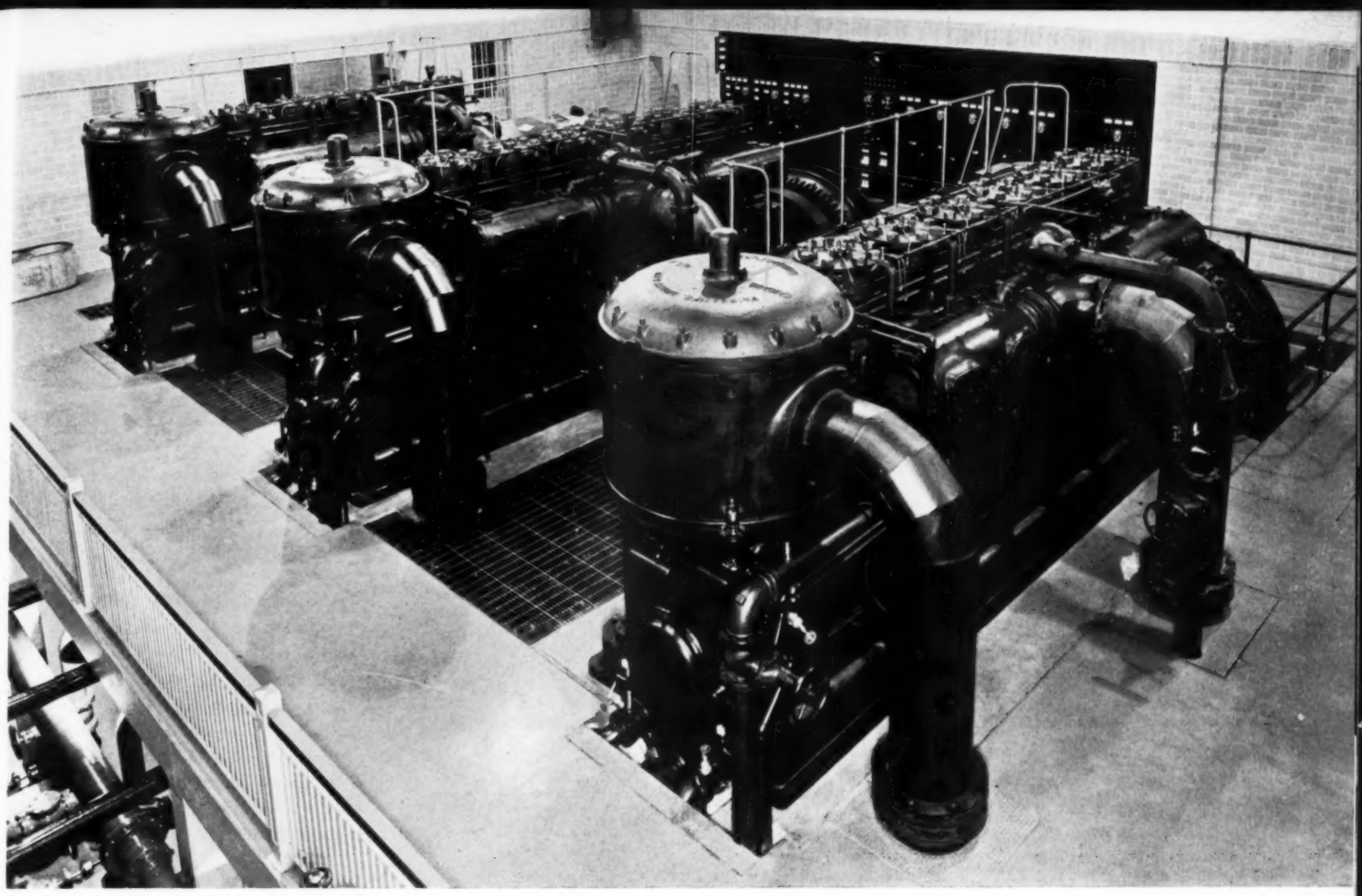
A Caterpillar D7700 Diesel engine was hastily set up and connected to a deep-well pump. A four mile pipe line temporarily replaced the ruined canal. With a constant load of 45 hp. the engine kept the reservoir filled with water.

For the first 45 days and nights, the engine ran without shutdowns, except for servicing. A total of 1,608 hours' run within 75 days required 4,346 gallons of 6¼ cent fuel and but 27 cents were spent for repairs.

Right — Caterpillar Diesel pumping water from deep well.

Below — The village of Hesperia, Mojave Desert.





JACKSONVILLE, ILLINOIS

By R. D. CAMPBELL

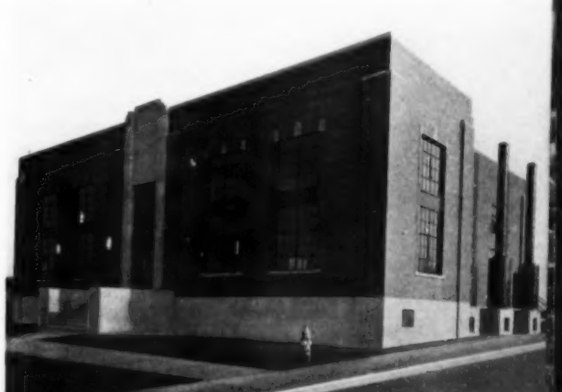
ON February 2, 1939, the City of Jacksonville, Illinois, began to generate its own power with Diesel engines, and thus the dreams of many years were finally realized. The Jacksonville plant is not only of importance to the citizens of Jacksonville but, due to the numerous legal steps and decisions which constitute an interesting chapter in the history of this plant, the way has been cleared for many other communities in Illinois to own and operate a municipal power plant.

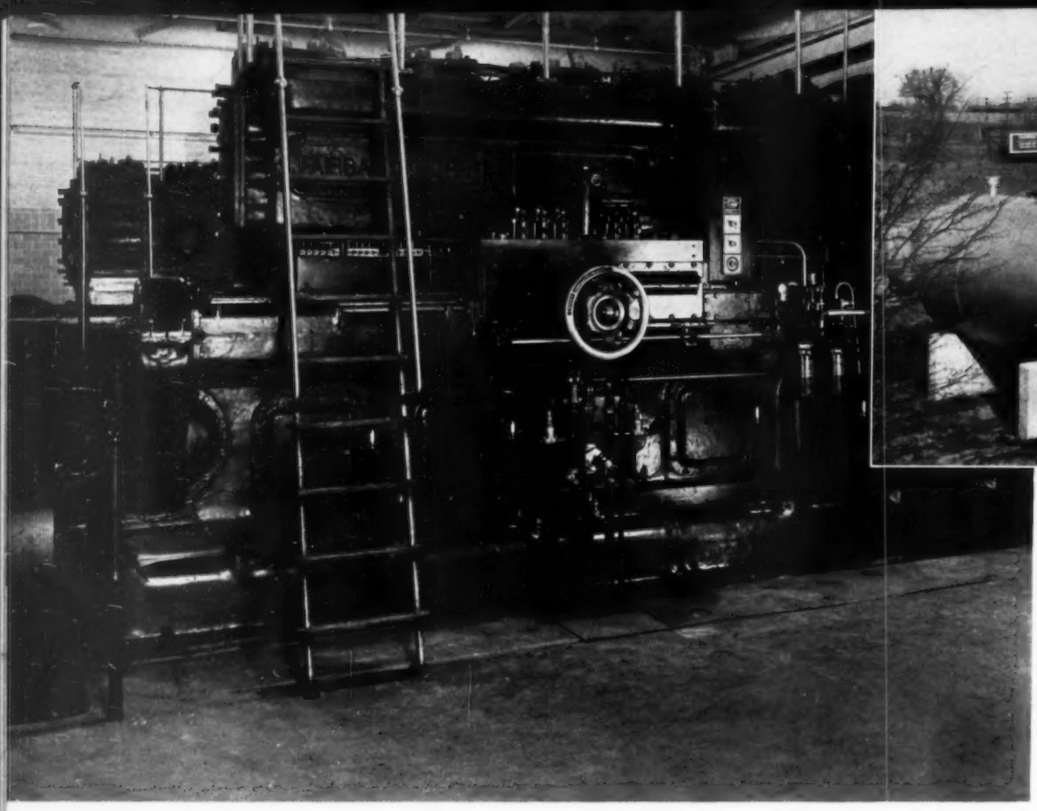
The general contract for the complete generating plant and machinery was performed by Fairbanks, Morse & Co., and the electrical distribution system work was contracted by the Monroe Electric Co. of Chicago, Illinois.

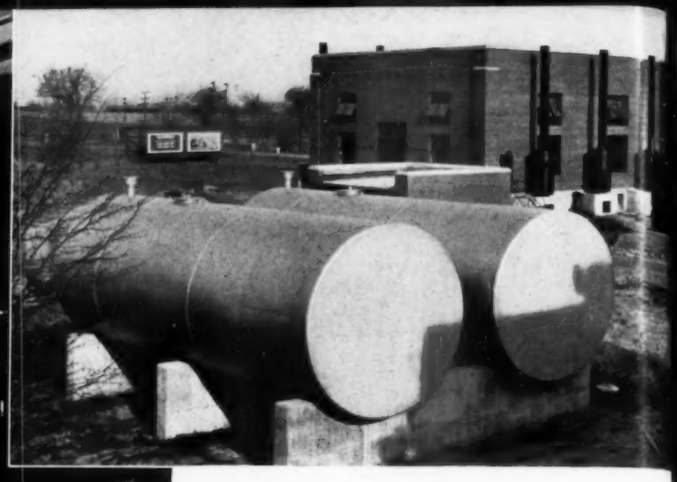
The main generating units consist of two 6-cylinder, 16 in. x 20 in., 2-cycle, 1,050 hp. Fairbanks-Morse, Model 33D16 Diesel engines, running 300 rpm. and direct-connected to 739 kw. Fairbanks-Morse, 3-phase, 60-cycle, 2,400 volt alternators and 15 kw. direct-connected exciters, and one 5-cylinder, 16 in x 20 in, two-cycle, 875 hp. Fairbanks-Morse, Model 33D16 Diesel engine direct-connected to a 612 kw. alternator and a 15 kw. exciter. Each engine is equipped with a Woodward Type I.C. isochronous governor. The engines are of the pump scavenging type, using a reciprocating air compressor cylinder to supply all scavenging air. The pistons are oil-cooled and the crankcase is of the wet sump type. The pistons are fitted with six compression rings, and four oil scraper rings recessed into the cylinder skirt are used to prevent the piston lubricating oil from falling into the crankcase. All working pistons and the air pump piston are lubricated by Madison-Kipp force-feed lubricators and the excess oil removed by the scraper rings is conveyed to the dirty oil reservoirs where it is filtered by Sentinel filters before being returned to the engines for further use.

The intake air for each engine is drawn in from outside the building through a Maxim silencer, filtered through a battery of twelve American Air Filter cells, Type OC, before entering the scavenging air pump which delivers the air, at a pressure of 1½ to 2 lbs., to a common header which supplies all cylinders on the engine. The exhaust is collected in a

Exterior view of the splendid new Municipal Diesel Power Plant at Jacksonville, Illinois.







water-cooled exhaust manifold and conducted downward through Foster-Wheeler waste heat boilers located in the basement. Each engine exhaust is fitted with a 3 ft. length of flexible exhaust pipe 20 in. in diameter to form the connection to the waste heat boiler. From the boiler, the exhaust is conducted to the outside and up through 20 in. Maxim Type BRM2 exhaust silencer. The steam produced by the waste heat boilers is used to heat the engine room and office and workshops, using Webster-Nesbitt unit heaters and a radiator system.

The engine cooling is effected by a dual or soft and raw water system, using two Schutte-Koerting size 9-8X-2P heat exchangers to transfer the heat from the soft water (engine jackets) circuit to the raw water (cooling tower) circuit. The cooling tower is a Marley atmospheric type, 66 ft. long, 12 ft. wide, and 10 ft. high. The entire cooling tower is built above a concrete basin 4 ft. in depth (66 ft. x 12 ft. surface dimensions) and is located at such an elevation that the water flows by gravity to the raw water pumps in the engine room basement. The raw water is circulated by three 10 hp. 3-phase 60-cycle 220 v. 1,740 rpm. Fairbanks-Morse motors, direct-connected to 4 in. Fig. 5811 NE bronze fitted double-suction ball-bearing centrifugal pumps. All raw water pumps discharge into a common header supplying the two Schutte-Koerting heat exchangers and thus any pump may be used for cooling any engine. The water for cooling the engine jackets is softened by a Permutit Zeolite type water softener. The water is circulated from the heat exchangers to the engines by means of three Fairbanks-Morse pumps of the same type as those handling the raw water but driven by 7½ hp. motors. Each soft water pump discharges into a common cooling water header which supplies all engines, and thus any soft water pump may be used to cool any one of the engines.

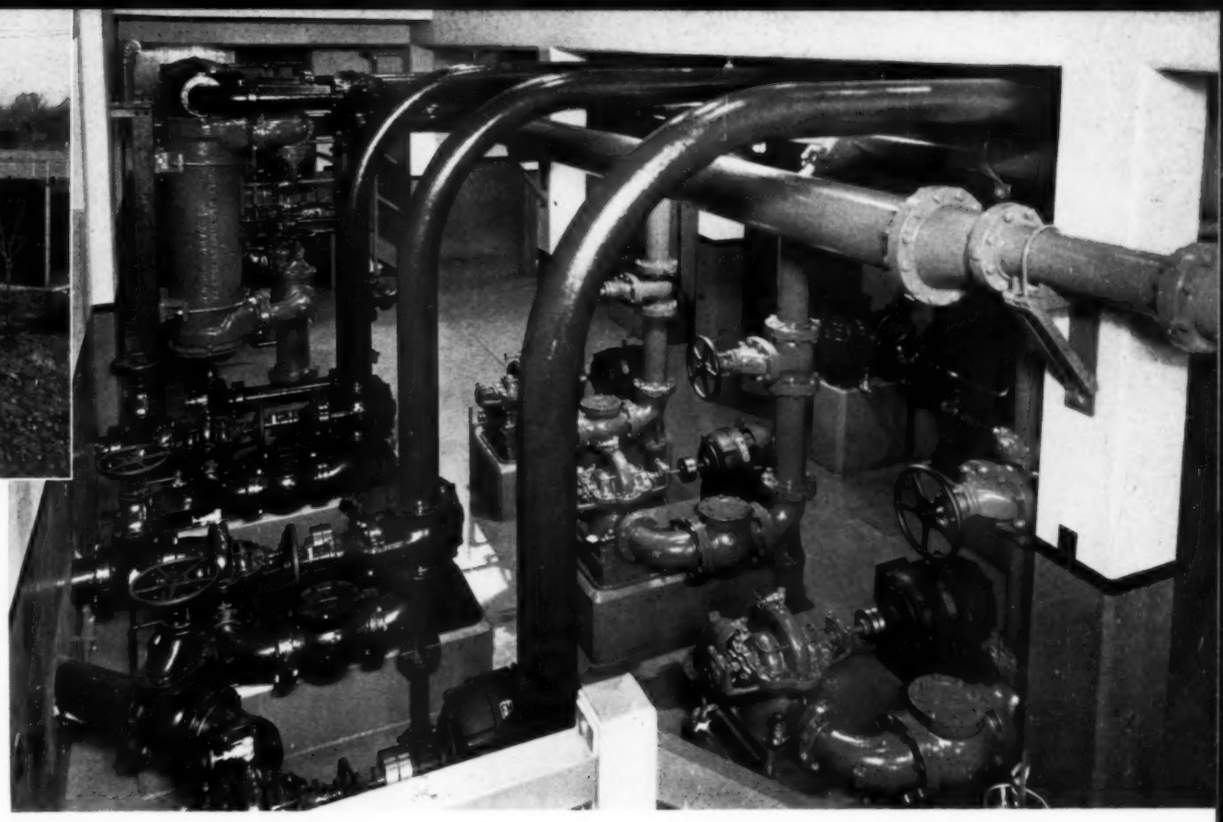
Each pump is fitted with a pressure gauge on the suction and discharge lines. Cooling water thermometers are located on each water header, on the heat exchangers, on each engine cylinder, and on the main discharge lines from each engine. The latter are inserted in the cooling water discharge lines at a point about 5 feet above the operating floor, thus enabling the operator to determine the average cooling water temperature from the engine without climbing up onto the engine and reading each of several cylinder thermometers. An alarm system is mounted on the main switchboard which warns the operator of dangerous conditions of the water, oil, and exhaust system.

An auxiliary panel on the switchboard has a number of red signal lights, one for each engine lube oil pressure, , one for each engine lube oil temperature, one for low water pressure, and one for high water temperature on the soft water circuit of each engine and one for the exhaust temperature of each engine. The system is so arranged that a bell alarm will sound and the corresponding light will be lighted when any irregularities occur at the points listed. The bell attracts the operator's attention and the light indicates the nature of the trouble to be corrected.

A dual-scale Alnor pyrometer is mounted on each engine panel of the switchboard. The lower scale has a range of 40° to 220° F., and has contact points for the inlet and outlet cooling water temperatures, for the inlet and outlet lube oil temperatures, and a test point for adjusting the instruments. The high temperature scale is graduated from 0 to 1,000° F. and has a contact point to show the temperature of the exhaust from each cylinder.

Starting air at 250 lbs. is furnished by a Gardner-Denver Type ADD 3002 two-stage air-cooled compressor V-belt driven from a 7½ hp. Fairbanks-Morse motor. For the initial start of the engines and in reserve for emergency is a 3½ x 2 x 2½ type ADA 1004 Gardner-Denver two-stage air-cooled compressor driven by a 3 hp. Fairbanks-Morse gasoline engine. The air is stored in three 20 in. x 96 in. welded steel air tanks, designed for 250 lb. working pressure supplied by the Diesel Plant Specialties Co.

There is a bulk storage of oil in two tanks, each of 20,000 gallons capacity, with an unloading and transfer system. A 625 gal. day fuel tank is provided for each engine and all three tanks are located inside of an oil house which is midway between the bulk storage tanks and the main plant building. From the day tanks the fuel again flows by gravity to vertical gauge tanks located in the basement of the engine room. The fuel oil suction and return lines are connected from each gauge tank to its respective engine. The return flow of fuel from the injection pumps and the injection nozzle drip lines are drained back to the gauge tanks. Each engine is equipped with two Nugent fuel oil filters mounted on the control side of the engine near the fuel injection pumps. The Nugent filters are connected in parallel and the connections are ar-



Left — Operating side of one of the six-cylinder 1,050 hp. Fairbanks-Morse Diesel engines showing fuel pump, Woodward governor, and duplex Nugent filters. Above — The backyard showing fuel storage tanks, three Maxim silencers, and the Marley cooling tower. Right — Pump room with Schutte Koerting heat exchanger.

ranged to permit the cleaning of each filter while the fuel is filtered by the other filter. The fuel used is Shell Petroleum's "Dieseline" having properties as follows:

Cetane number	50 min.
Viscosity at 100° F.	38 S.S.U.
B. S. & W.	none
Pour Point degrees F.	0 max.
Flash Point degrees F.	150 min.
Carbon Residue per cent by weight	.01
Sulfur per cent by weight	.75 max.
Gravity A.P.I.	32-37
Color	cherry red*

(*Special color for identification)

Each engine is equipped with a built-in lubricating oil circulating pump for supplying the oil to the main bearings and to the pistons for cooling purposes. The built-in pump is used while the engine is in operation. There is, however, an electric-driven gear-type of pump used for oil circulation before the engine is started and for after-cooling the engine following a period of operation. The main circulating system also supplies the force-feed cylinder lubricator and keeps it full. The force-feed lubricator, manufactured by the Madison-Kipp Company, has three feeds for each power cylinder and two feeds for the air pump piston guides. Hence, the lubricator on the 5-cylinder engine has seventeen feeds, while the lubricators on the 6-cylinder engines have twenty feeds each. Other lube oil equipment consists of a 500 gal. welded steel storage tank located in the basement and used for storing new oil.

A Type S Renuoil purifier is used to clean the oil and restore its viscosity and color. The oil is treated by this process only when it has become dark in color and diluted or contaminated in such a manner that the continuous filters cannot remove the contaminant.

The switchboard is of the steel panel, dead front type and was built and erected by the Westinghouse Electric & Mfg. Co. There are three engine panels and one blank panel for future use. Each 30 in. x 78 in. engine panel is equipped with the following instruments:

Power factor meter	range .5 lag to .5 lead
Indicating kw. meter	range 0-1000 kw.
Frequency meter	range 50-70 cycles
D.C. exciter voltmeter	0-150 v.
D.C. exciter ammeter	0-150 amps.
A.C. ammeter	0-300 amps.

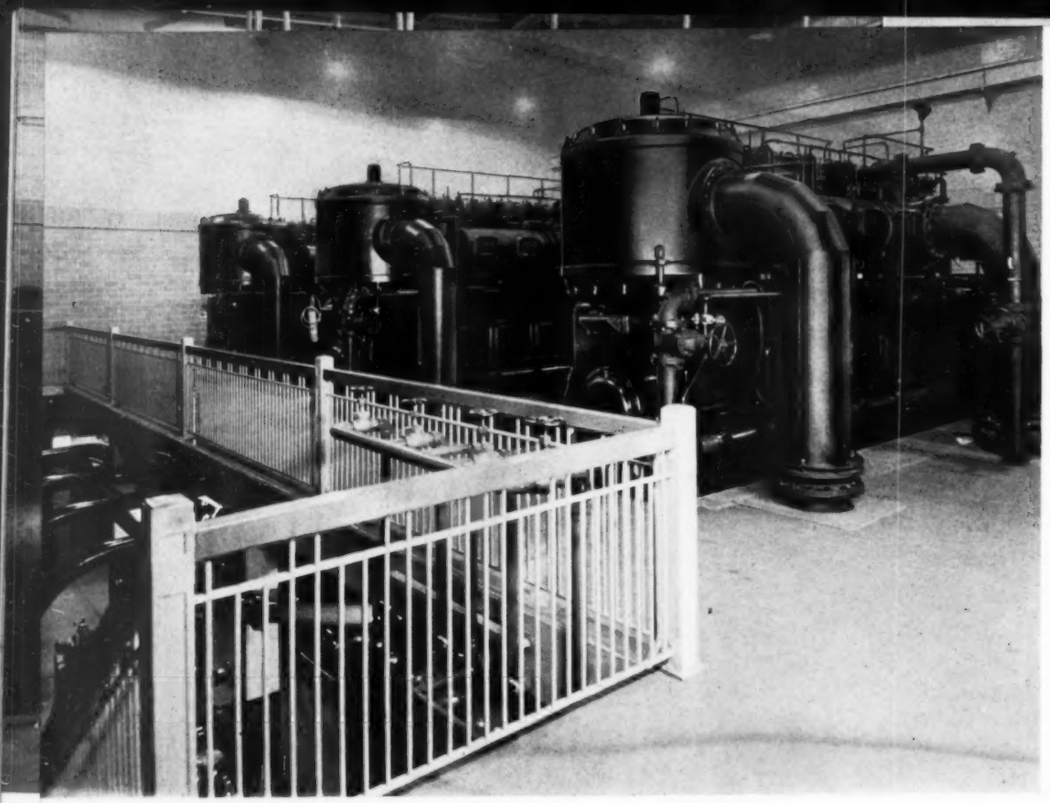
Integrating polyphase watt hour meter.

All instruments mentioned above and the main circuit breaker switch are manufactured by the Westinghouse Electric & Mfg. Co. The synchronizing equipment is mounted on a swinging bracket and consists of the following Westinghouse instruments: One frequency meter 50-70 cycle, one synchroscope, and two A.C. voltmeters 0-3000 volts range, one indicating the line voltage, and the other indicating the voltage of the unit being synchronized.

There are four distribution panels; a blank panel for an additional circuit and the station panel, all of the same appearance as the engine panels. There is a central control panel on which are mounted three Allis-Chalmers rocking contact (Brown-Boveri) type voltage regulators, and the following Westinghouse graphic recording equipment: One watt-meter, one frequency meter, and one voltmeter. These instruments make a continuous record of any fluctuations in the load, frequency, and line voltage.

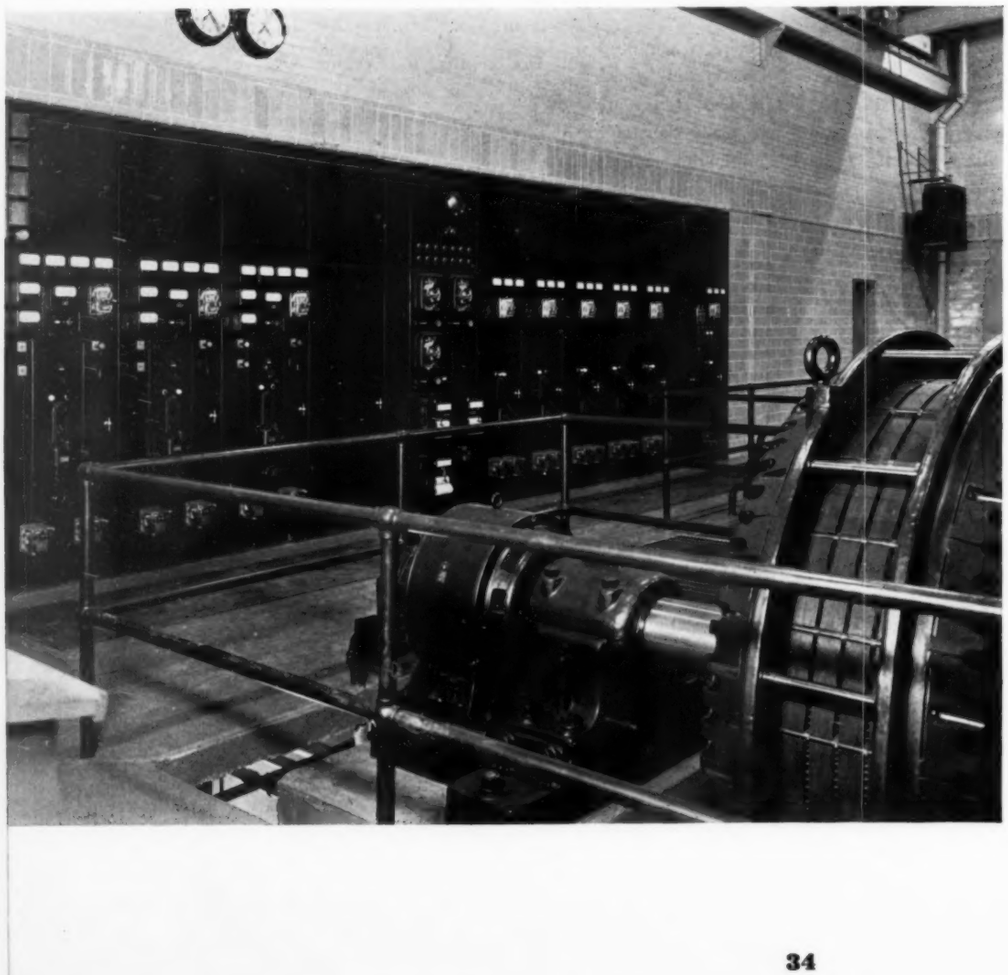
Jacksonville, the county seat of Morgan County, has a population of 18,000 and is situated about 90 miles due north of St. Louis. It is a college town and is served by four major railroads. This town boasts of many industries; such as, railroad shops, flour and paper mills, structural steel shops and exports of grain and live stock. The city has owned its own water system for many years. Prior to the inception of the Jacksonville plant, no city had obtained favorable interpretations or decisions on certain portions of the Illinois Municipal Utilities Act, and it was the City of Jacksonville which eventually carried its case through the courts and cleared the way for municipal ownership in Illinois.

The first step towards the procurement of a municipal plant was in February, 1934, when the City Council passed a resolution directing an application to the Public Works Administration for a loan and grant totalling $500,000 to be used for water works improvement and the construction of a power plant. In March, 1935, the City Council converted this application into a request for a loan and grant of $420,000 to be used for a power plant only. On September 5, 1935, the City Council re-



General view of the Jacksonville, Illinois, Municipal Diesel Plant showing two six-cylinder 1,050 hp. Fairbanks-Morse and one five-cylinder 875 hp. Fairbanks-Morse Diesel engines.

Switchboard in the Jacksonville, Illinois, Municipal Diesel Plant showing three dual-scale Alnor pyrometers on the three left-hand panels. Unit heater for heating the engine room is in upper right corner.



ceived notice of an allotment of the amount requested, 45 per cent of which was to be a grant and the remaining 55 per cent to be a loan. The City Council passed the necessary ordnance covering construction of a power plant and a general election passed the bond issue during 1935 and 1936. The next two years were filled with numerous court actions and injunctions in both Federal and state courts. In April, 1937, however, the Supreme Court of Illinois handed down a unanimous decision upholding the validity of the procedure under the state act and establishing the validity of the ordnance and securities issued under it. In January, 1938, a decision in the now famous Duke and Alabama cases cleared up all Federal questions and, by February 1, the remaining action in the Federal court at Springfield against the City of Jacksonville was dismissed.

In February, 1938, the firm of Warren & Van Praag, Inc., Consulting Engineers of Decatur, Illinois, which firm had been continuously engaged upon the project since its inception in 1934, was instructed to draw up the final plans and specifications for the plant and distribution system. Bids were taken on April 20 and the awards made on April 30. Formal contracts were signed on May 13 and construction was begun the same day. Within nine months the distribution system, plant buildings, and machinery were completed and Jacksonville was generating its own current. On February 2, 1939, the city plant was lighting the street lights and on February 14 the city announced its rates and began making connections to the customers. The rates represent a 25 per cent reduction over the rates in effect when the municipal ownership move was started. During the first thirty days, the municipal plant has made 650 customer connections, and has reached a peak load of 625 kw. Connections are being made at the rate of about 30 per working day and will continue until all residents desiring the municipal electric service are connected.

The completion of a project of such magnitude and of such importance represents much effort and forethought on the part of many people. The City of Jacksonville is justly proud of Mr. Orville N. Foreman, their legal counsel throughout the five year struggle, the consulting engineers and the numerous members of the City Councils. Due to the time elapsed between the inception and completion of the project, there were three successive groups of councilmen in office from the first action in 1934 until the completion of the project in 1939.

DIESELS SERVE THE OIL FIELDS

By GEORGE D. CROSSLEY

AN International Diesel wheel-type tractor, equipped with a Wilson Super winch, is rendering excellent service to the Lincoln Oil Company and the illustration above shows this compact, efficient unit serving one of the company's fourteen wells in the Leeville field near Golden Meadow, Louisiana. F. N. Brasher, Superintendent of the Lincoln Oil Co., is shown at right listening to John W. Nunnery, Service Manager of the New Orleans International Harvester branch, and Harry Lake of the Industrial Tractor & Equipment Co. of Baton Rouge, Louisiana, International industrial equipment distributor.

DIESEL AVIATION

THE DIESEL AND MILITARY AVIATION

By PAUL H. WILKINSON

NOW that military aircraft activities are being pushed to the limit in many countries, it might be interesting to see where the Diesel fits into the picture. So far, the only engines about which information has been released regarding their use in military aircraft have been the Junkers Jumo 205-C and Jumo 205-E Diesels of 600 hp. and 700 hp. respectively. Despite the relatively low power output of these engines for military purposes, they have been used on several important types of aircraft.

Perhaps the best known Diesel-engined military airplane, is the twin-engined Junkers Ju 86 K fighter-bomber with which many squadrons of the German Air Force are equipped. These fighter-bombers have three gun turrets — one in the nose, one amidships above the fuselage and one of a retractable type below the fuselage. When the Ju 86 K was first developed from the Ju 86 ten-passenger airliner in 1936, it had a maximum speed of 183 mph. with 600 hp. Jumo 205-C Diesels. Recently, its performance has been considerably improved by the substitution of much more powerful military versions of this engine equipped with turbo-superchargers. It is probable that these planes now attain a speed of approximately 250 mph. at high altitudes.

Simultaneous with this development, the twin-engined Dornier Do 18 flying boat which has established a fine reputation as a long-range mail plane, was produced as a patrol plane for naval use. The military version, when powered with 600 hp. Jumo 205-C Diesels, has a maximum speed of 162 mph. It has two gun turrets and carries a crew of four. A number of these planes have been built and commissioned for advance training purposes in the Baltic and the North Sea.

A third type of airplane which possibly has its counterpart in the German Air Force, is the four-engined Blohm & Voss Ha-139 seaplane. As a torpedo-carrier, it would be quite effective on account of its twin-float design. The commercial version of the plane, powered with 600 hp. Jumo 205-C Diesels, has a maximum speed of 202 mph.

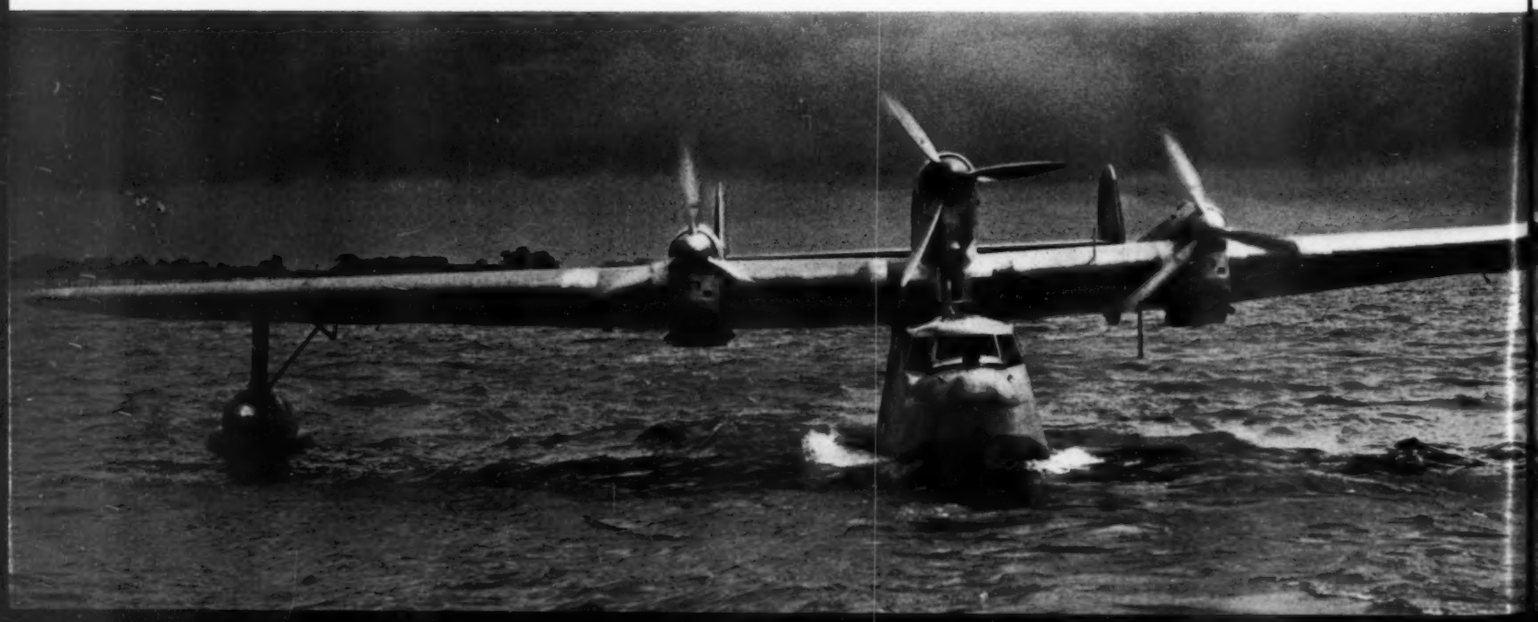
The latest addition to the long-range patrol planes of the German Air Force, is the three-engined Blohm & Voss BV 138 flying boat. It is appreciably faster than the Dornier Do 18, and it is considerably better armed. The BV 138 has a maximum speed of 171 mph. when powered with 600 hp. Jumo 205-C Diesels. With more powerful military-type Diesels, it should attain a speed of approximately 200 mph.

As will be seen from the illustrations of the BV 138 patrol flying boat which accompany this article, the most noticeable feature is the use of two tail booms extending back from the wing to support the tail surfaces. This is a good arrangement on a military plane as it makes possible a clear range of fire from the stern which is the most vulnerable point of attack. Two gun turrets, one firing above the other one as on a battleship, are located at the rear of the boat-like hull. There is a third turret of the retractable type in the bow. Thus, it has a strong defensive armament with no blind spots from which it can be attacked.

The wing construction of the new flying boat is similar to that developed by Dr. Vogt for previous Blohm & Voss aircraft. The wing is in three sections, with the center section built around a tubular spar of welded steel construction. The tubular wing spars of the two outer sections are made of duralumin and are attached to the center portion by means of flanged joints. The center portion of the spar supports the three engines and the two tail booms which are attached to it at the rear of the outboard engine nacelles. It also constitutes the fuel tanks for the three engines.

The hull is constructed of duralumin, with seven water-tight bulkheads. Inside the bow, there is space for the usual navigation equipment. Directly behind this, is the front retractable machine gun turret. Next comes the pilots' cabin with the seats raised sufficiently so that there is a clear view over the turret when the latter is retracted, or around its domed top when it is raised in a firing position. The rear part of the pilots' cabin is occupied by the radio equipment and the chart table. Behind this, comes a combined bunk room and

Front view of the new BV 138 patrol flying boat showing the low frontal area of the engines. The wing tip floats are supported by cantilever struts.

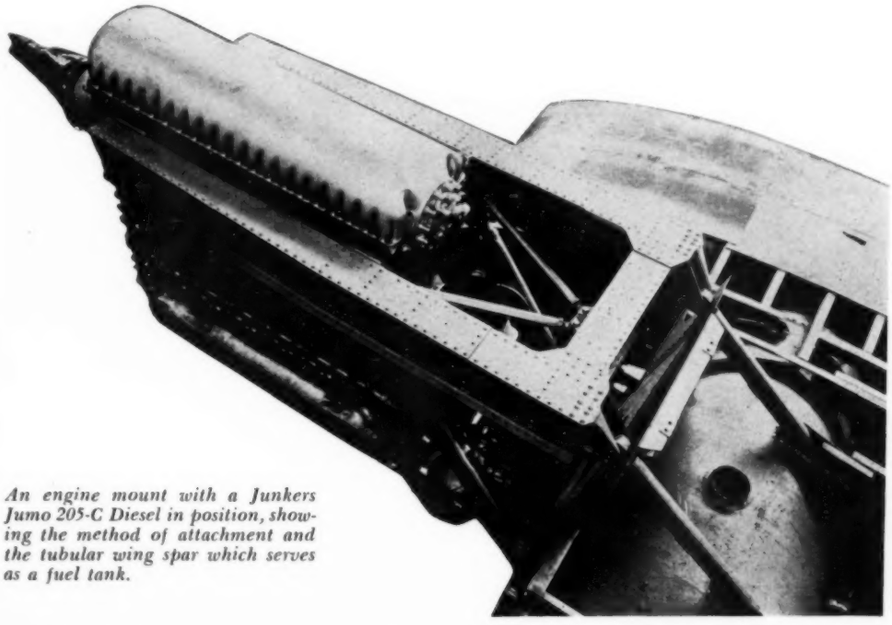


The new Blohm & Voss BV 138 patrol flying boat is powered with three 600 hp. Junkers Jumo 205-C Diesels. It is equipped with three machine gun turrets (two of them retractable).

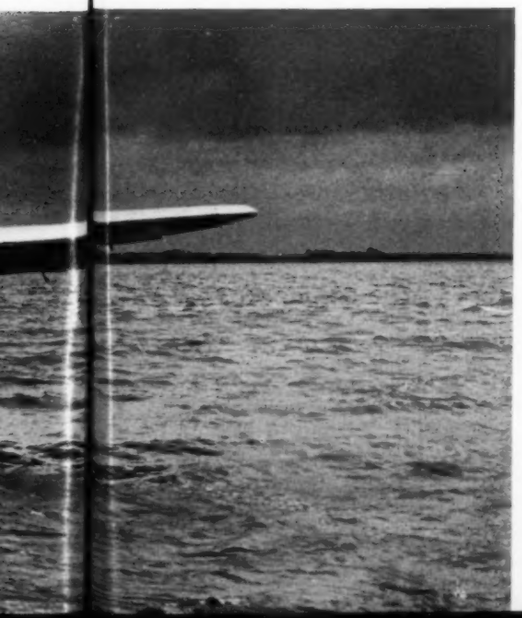
mess room for the crew, and then in the stern, is the rear retractable machine gun turret. The third gun turret is at the extremity of the turtle-back above the main portion of the hull.

The three 600 hp. Junkers Jumo 205-C Diesels are supported on semi-flexible engine mounts of a new type attached to the steel portion of the tubular spar. Small tunnel radiators are provided behind the two outboard engines for their cooling systems, while the radiator for the center engine is directly below it in the leading edge of the wing. Three-bladed controllable-pitch propellers are used.

The new flying boat has a span of 88.6 ft., an overall length of 65.3 ft. and a hull length of 49.5 ft. The wing area is 1,206 sq. ft. The empty weight of the plane is 17,855 lb., and the useful load is 8,375 lb., making the gross weight 26,230 lb. It is possible, however, to increase the useful load to 14,550 lb., thereby raising the gross weight to 32,405 lb. Cruising at a speed of 146 mph., the flight range with normal load is 1,490 miles, while with a maximum fuel load, this can be increased to 3,100 miles. A crew of from 4 to 5 men is carried for regular flight operations, and catapult launching can be used if desired.



An engine mount with a Junkers Jumo 205-C Diesel in position, showing the method of attachment and the tubular wing spar which serves as a fuel tank.



These planes comprise, for the moment, the types of military aircraft powered with Junkers Jumo 205 Diesels about which particulars have been released. While they are not in the high-speed category, nevertheless they are useful service planes with which a great deal of experience can be obtained. They constitute the stepping stones to the high-speed Diesel-engined military airplanes of tomorrow.

While the Junkers Jumo 205-C Diesel with a rating of 600 hp. is standard equipment on most of these planes, it must not be thought that this is the limit of its power output by any means. As has been mentioned before, there are military versions of the engine equipped with turbo-superchargers which develop considerably more power than even the 700 hp. Jumo 205-E. It is not at all unreasonable to assume that at least 850 hp. is now being taken from the engine, and it is probable that a power output of 1,000 hp. will soon be obtained. These higher output versions of the Jumo 205 Diesel are at present on the restricted list.

Now that an engine as small as the Jumo 205 Diesel can be built to give from 800 to 1,000 hp., it will be possible for the Diesel to compete with the gasoline engine in the high-performance aircraft field. The specific weight of the Diesel will be brought down to less than 1.5 lb. per hp., including its cooling system. It will have the advantage of the extremely low frontal area of only 8.75 sq. ft., which will more than offset the slight additional engine weight. Speeds well in excess of 300 mph. will then be possible with Diesel-engined aircraft, and they will enter the fighter class in the military aircraft field.

What is needed at the moment, is a Diesel of from 1,000 hp. to 1,200 hp. for large multi-engined aircraft. There is every indication that the Junkers Jumo 206 Diesel will soon be available for this purpose, both in the military and the commercial field. It is logical to assume that this engine will be developed up to 1,500 hp., leaving the various versions of the Jumo 205 to supply the 600 hp. to 1,000 hp. field. For power plants of 2,000 hp. and up, there will be "square" type Junkers Diesel of low frontal area and weight. The last mentioned engine is well advanced in its development and it is probable that an announcement regarding it will be made before the end of the year.

The Elco Diesel-powered Yacht-53 passing the skyscrapers of lower Manhattan on its way to the New York World's Fair.

WORLD'S FAIR "ELCO 53"

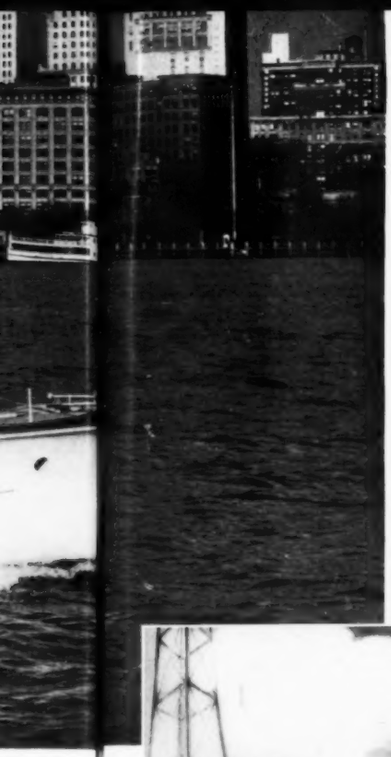
By WILL H. FULLERTON

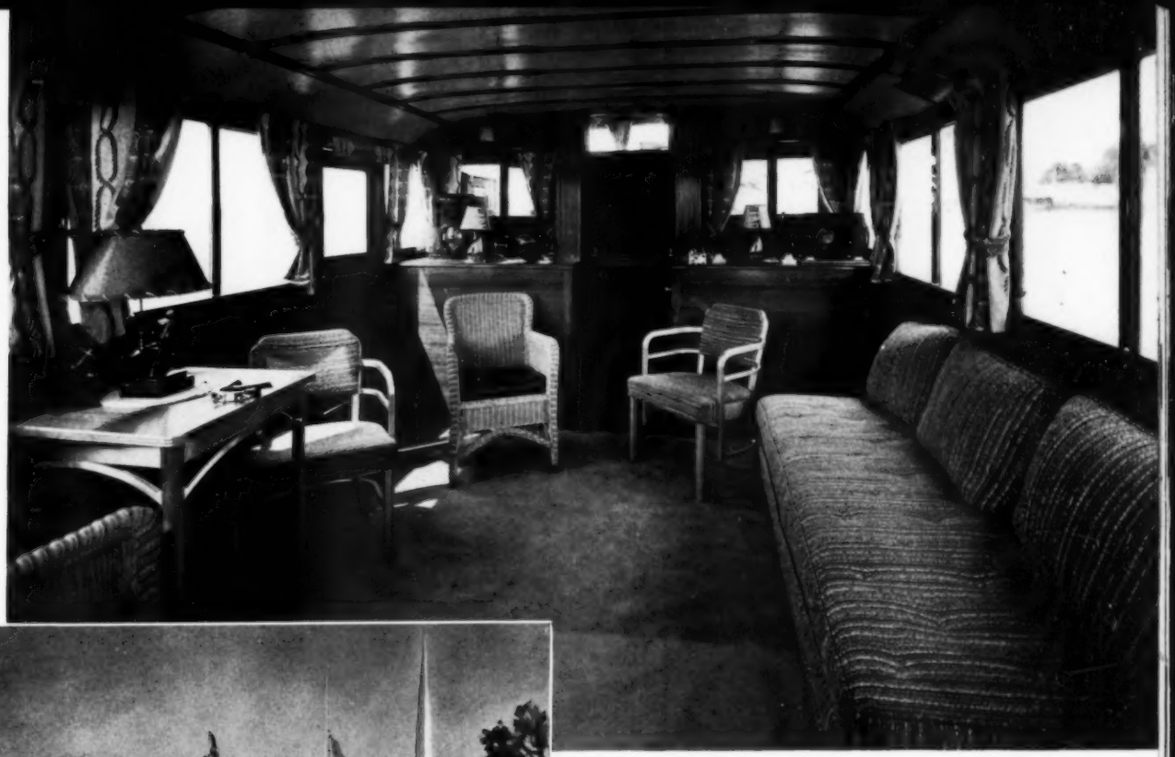
THIS Diesel-powered fifty-three foot Elco Yacht cruised the East River with the skyscrapers of New York to port and Brooklyn to starboard March 19, 1939, while N.B.C. engineers aboard her handled the marine portion of the broadcast "America Travels." This was a general broadcast of voice communication between persons on the Elco, in an automobile on the Lincoln Highway in New Jersey, in an air liner flying over New York, and on a fast express train. After performing its part in these modern miracles of communication and transportation, the Elco was taken to the New York World's Fair where it will be displayed in a special basin as part of the R.C.A. exhibit.

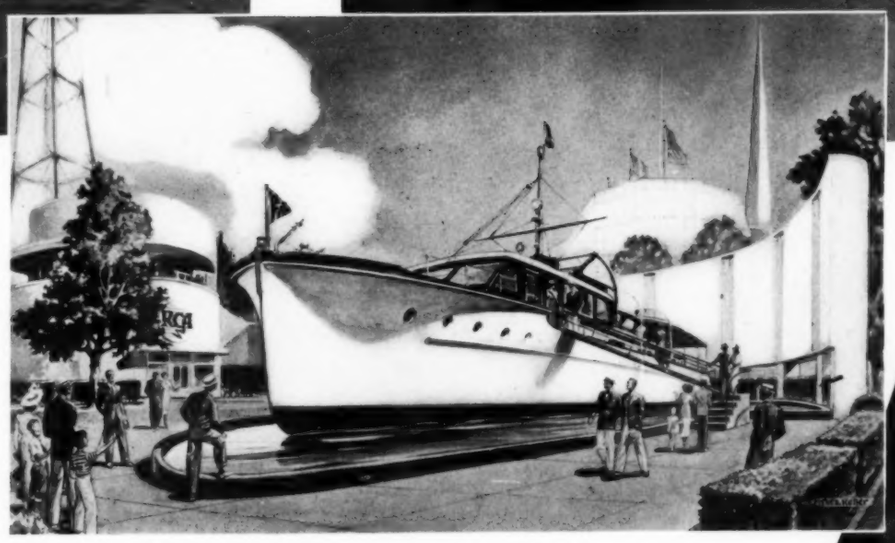
The Elco 53 is the largest, most powerful, and most luxurious stock model built at the Elco Works. Its overall length is 53 feet, beam 13 feet 9 inches, and draft 3 feet. Spacious accommodations are provided for six in the owner's party and a crew of two. Powered by a pair of 165 hp. 6-cylinder 2-cycle 4¼ in. bore by 5 in. stroke, Gary Marine Diesel engines, this Elco makes eighteen miles per hour with engines turning about 1,900 rpm. These engines are based on the engine developed and built by General Motors, adapted and equipped for marine use by Gray. The engines are installed as a symmetrical right and left pair with 1.5 : 1 reduction gears. The cooling system is the built-in closed fresh water type, with sea water pump and thermostat. Regular engine equipment includes starter, generator, governor set for 300 rpm. idling speed and protected against overspeed, oil cooler, lube oil filter, fuel oil filter, instrument panel with tachometer, ammeter, oil pressure, and temperature gauges and water temperature gauge.

Pistons are oil cooled by means of heat dissipating fins cast on the under side of the piston crowns against which oil is pumped through the connecting rod. Fuel injection is accomplished by the unit injector in which are combined the functions of metering, injecting and atomizing the fuel. This system eliminates high pressure fuel lines.

The engine beds are Elco patented type, consisting of steel girders hung in adjustable rubber cushions which absorb 90 per cent of the vibration from the engines. Full size copper pans with splash rims are fitted under the engines. Exhausts are of 4 inch copper tubing with 4 inch Bowler, Holmes & Hecker Hi-Duty mufflers located in the engine room and connected to the engines by a length of Penn-Flex metal hose. A special Elco water jacketed elbow is set in the manifold connection and water is discharged into the muffler to further absorb sound waves. The exhaust tubing is lagged so that it is not over hand warm. The engine compartment and the saloon deck are sound-insulated with spun glass sound absorbative material. Propeller shafts are 1¾ in. Tobin bronze with steel inside shafts and are fitted with tapered couplings, Elco flexible inside stuffing boxes, copper shaft sleeves and





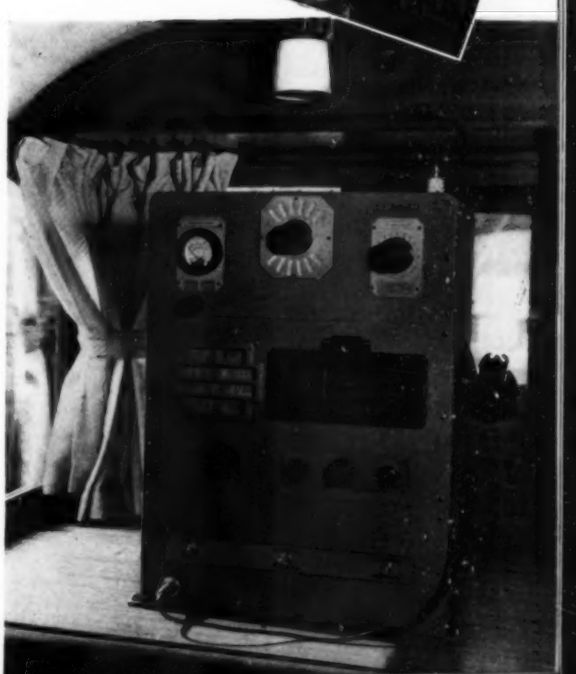


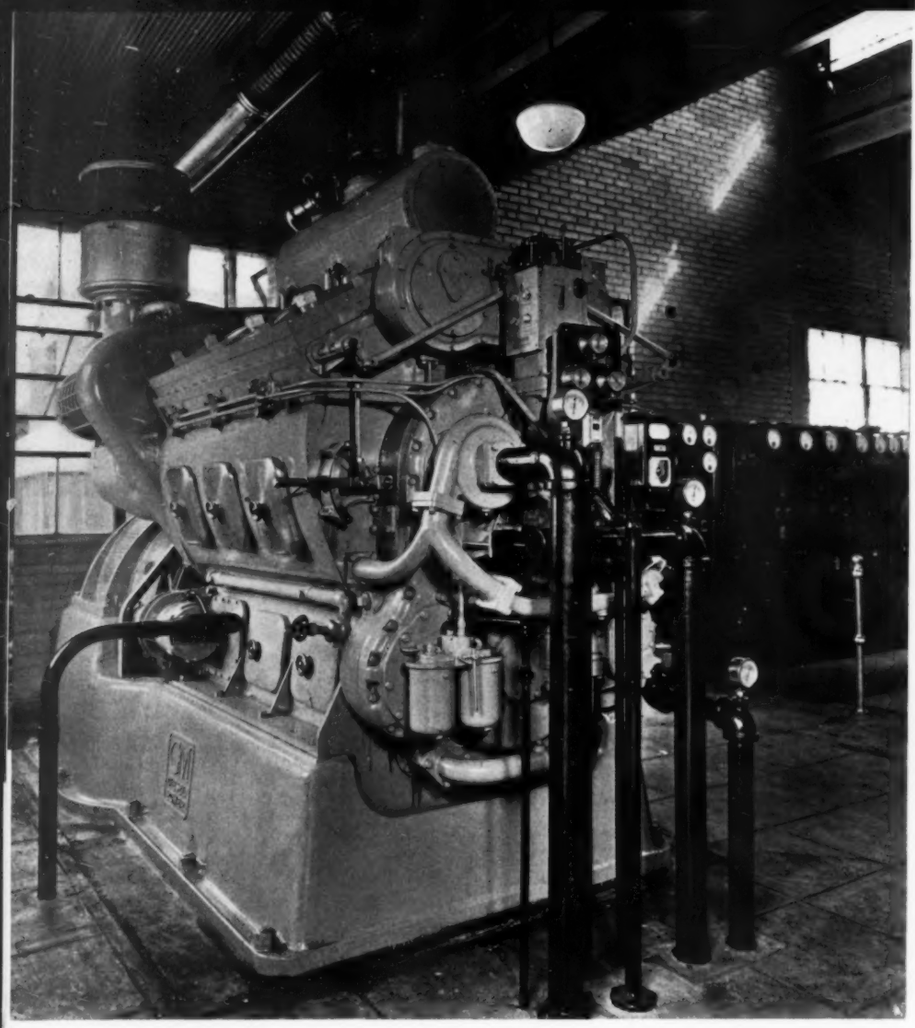
Top — Aft view of the Elco's spacious and luxuriously appointed cabin. Above — Artist's conception of the Elco-53 as it will appear in its specially designed basin as part of the R.C.A. exhibit at the New York World's Fair 1939. Right — N.B.C. engineers handling the control during broadcast, "America Travels" while the motor yacht cruised in the East River off Brooklyn Navy Yard Sunday, March 19, 1939. Below — Radio telephone communication set installed aboard the Elco-53 enabling voice communication to and from the boat with persons in an automobile, train and aeroplane.

large and small outside struts with cutless rubber bushings. Propellers are bronze Columbian three blades, 26 in. diameter, turning right and left.

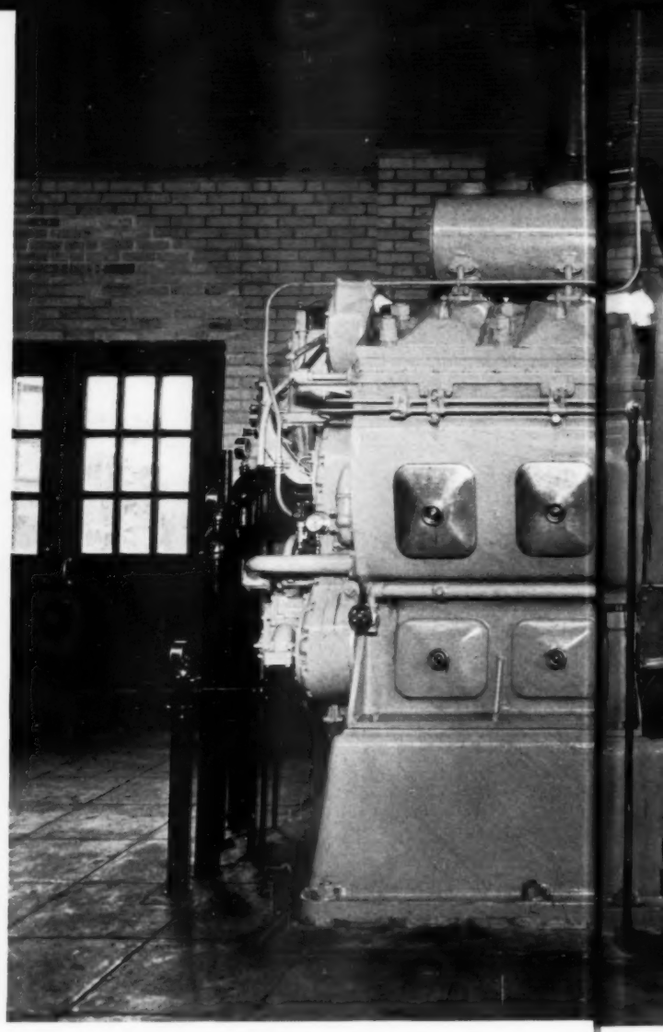
Controls are manual type, the throttle and reverse levers being located on the bridge on either side of the steering wheel. All instruments and starting switches are located on the bridge and are protected from the weather. The steering gear is the regular Elco type with ship's wheel and helm angle indicating device. Connection to the quandrants on the twin rudders is by means of bronze tiller lines running over bronze sheaves.

The electric system consists of 32 volt 250 watt generators on the engines and a Delco 800 watt generating plant arranged to run on fuel oil. The battery equipment is a large size set of Exide lead plate batteries for each engine connected through the switchboard, so either bank of batteries may be cut into the boat's lighting circuits and either set may be charged by the auxiliary generator, as well as by its own engine generator. Either engine may be started from either bank of batteries. In the Elco 53, special emphasis has been placed on seaworthiness and rugged construction, since it is intended that the boats will be entirely suitable for extended coastwise cruising, as well as weekend trips.





View showing operating end of General Motors V-type 2-cycle Diesel engine with switchboard shown in the right background.



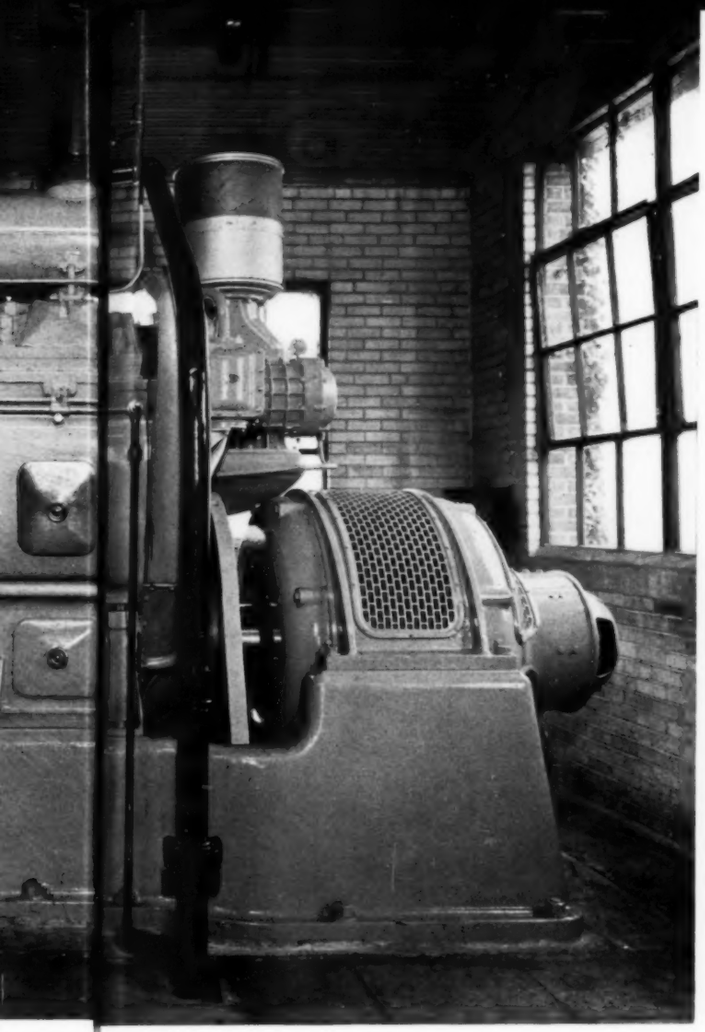
Side view illustrating compactness of integral engine and generating base.

ANTIOCH COLLEGE

By GEORGE D. CROSSLEY

THE heat, light, and power requirements of Antioch College and the village of Yellow Springs, Ohio, have been supplied by two Ames 150 kw. sixteen by sixteen single cylinder horizontal Unaflow steam engines operating on 170 pounds dry saturated steam and supplying exhaust steam for heating requirements throughout the campus. This steam plant was installed some ten years ago, but the load has been consistently growing to such a degree that an almost constant overload condition existed last year. Consequently late last year a new Diesel generating unit was put on the lines to meet the increased power demand resulting from physical growth of the institution. The steam plant has served as a supplementary laboratory for mechanical and electrical engineering students; the new Diesel installation will further serve to acquaint students with modern generating equipment. The Diesel engine is a General Motors Model 6-567 V-type 2-cycle 6-cylinder, 8½" bore x 10" stroke, developing 450 hp. at 720 rpm. This engine employs a specially designed unit fuel injection system. The unit fuel injector combines the spray nozzle and the high-pressure fuel pump in a single, easily removable unit. The fuel is injected directly into the combustion chamber in a controlled spray which does not touch the cylinder walls.

A Westinghouse 300 kw. generator is direct-connected and is mounted on the engine base extension. The installation is exceptionally clean cut with all engine accessories either built in or mounted adjacent to the engine. Built in are Harrison Radiator jacket water and lube oil coolers, Purolator lube oil and fuel oil filters, A.C. intake air silencer and filter. Mounted at the control end of the engine are the Clark controller starter push button switch, the Brown Instrument exhaust pyrometer, G. & E. Corp. jacket and cooling water thermometers and fuel and lube oil pressure gauges. Cooling water high temperature, lube oil low pressure, and piston cooling oil



Above — Exterior view of combined steam and Diesel generating plant.

Below — Exterior view of Diesel engine room showing Maxim exhaust silencer.

alarm control switches are all "Genuine Detroit" Model 250 built by the Detroit Lubricator Co. These switches operate a Faraday alarm gong and signal light mounted high on the engine room wall. A Viking transfer pump supplies fuel oil from outside storage to the 50 gal. day tank mounted on wall brackets above the engine. Lube oil reclamation is handled by a Goulds Hydroil. The starting battery is an Exide with a Tungar charger. Engine exhaust is piped through the engine room wall to an outside horizontally mounted Maxim silencer. General Electric furnished the switchboard which is equipped with Westinghouse generator field rheostat, mechanically operated concentric rheostat, exciter field rheostat and field discharge resistor.

The campus of Antioch College spreads over eighty acres. The building group includes Antioch Hall, the administration building, dating back to 1853; Science Hall, a gift of Mr. C. F. Kettering; Horace Mann Memorial Library; College Infirmary; Rockford, a small chapel; the gymnasium; three large dormitories, several small dormitories, a tearoom, and the Corner House, a community social center. Founded eighty-six years ago by the progressive educator Horace Mann, Antioch was from the beginning an educational pioneer, and has always been strongly liberal in its traditions. In 1921 the college was completely reorganized under Dr. Arthur E. Morgan, and the co-operative plan of alternate work and study was instituted. In the eighteen years of its existence, the co-operative plan has contributed a significant new pattern to American college education. Not only does it give Antioch students training with business, industrial, and professional organizations in twenty states, it supplements the classroom and the textbook with the practical knowledge, experience, and discipline of work. When Dr. Morgan left Antioch in 1933 to go with the Tennessee Valley Authority, his place was taken by A. D. Henderson, now president, who is carrying on Antioch's progressive program. College enrollment is approximately 700 and the faculty number around 100.

ADLER DAIRY DEPENDS ON

By WILBUR W. YOUNG

SAMUEL ADLER, Inc., operating a large Metropolitan dairy, depends entirely on Diesel engines for all of its light and power requirements. Receiving, pasteurizing, cooling, bottling and distributing 1600 cans of milk (65,000 quarts) every day is a business that must go on. Lapses of power service would prove too costly to be tolerated. The responsibility for supplying continuous power is placed squarely on three Diesel Engines in the Adler Plant since all utility service was discontinued last year.

The engines in this plant are three Cummins Diesels, Model H16, 80 hp., 6 cylinder, four and seven/eighths inch bore by six inch stroke, 4 cycle, operating at 1200 rpm. Two of these engines are connected through Gates Vulco multiple Vee belt drives and Manning, Maxwell and Moore jaw clutches to Crocker-Wheeler 125 kw generators. Crocker-Wheeler 125 V exciters are multiple Vee belt driven off the extended generator shafts. The Cummins Engine Company branch plant in New York City assembled the above equipment on a structural steel sub base and moved the complete assembly by truck to the site of installation. It was then set in place and as soon as water, oil exhaust and electrical connections were made, the power plant was ready to take over the light and power loads.

A closed jacket water system using city water for makeup is equipped with a Harrison Radiator model HE 16 heat exchanger on each engine. Water temperature is controlled by an Excelso Tempo valve with a horn alarm through a Penn Electric switch. Small jacket water surge tanks for each engine are mounted on the engine room wall and are equipped with ball cock water level controls. A fifty gallon raw water tank, common to both engines, is also equipped with a ball cock water level valve.

The engines are battery started using Exide 6-XCK-21-3R batteries, Tungar charger, and Leece-Neville starting motors. The exhaust silencer on one engine is a Burgess Model ATP and on the other engine a Maxim Model BRM. The engine crankshafts were supplied by Ohio Crankshaft Co., piston rings by Perfect Circle Co., main and connecting rod bearings by Federal Mogul Co., flexible exhaust tubing by United Metal Hose Co., and continuous type lube oil purifiers on each engine by Skinner Purifiers. Other engine accessories include Donaldson air filters, Cuno fuel oil filter, and Nugent lube oil filters. Fuel injection is the low pressure distributor type. The engines are lubricated with Gulf Pride SAE 30 lube oil.

The switchboard supplied by the engine manufacturer is equipped with Roller Smith instruments and controls including remote governor controls for mechanically balancing the load between the two engines. Load balancing is affected by push button controlled circuits to small DC reversing motors mounted on each engine with chain drives to the governor control wheels. A Roller Smith two position switch exhaust pyrometer, which is a milivoltmeter calibrated to indicate temperature in degrees Fahrenheit, with Brown Instrument Co. thermocouples in the engine exhaust manifolds, is used in connection with the mechanical governor controls for load balancing. The governor controls also permit the operator to regulate engine speeds while engaging the generator clutches. Switchboard equipment also includes engine starting and stopping controls, battery charging controls and alarm circuits for low lube oil temperature and high jacket water temperature on a six drop annunciator and a Ward Leonard rheostatic type voltage regulator.

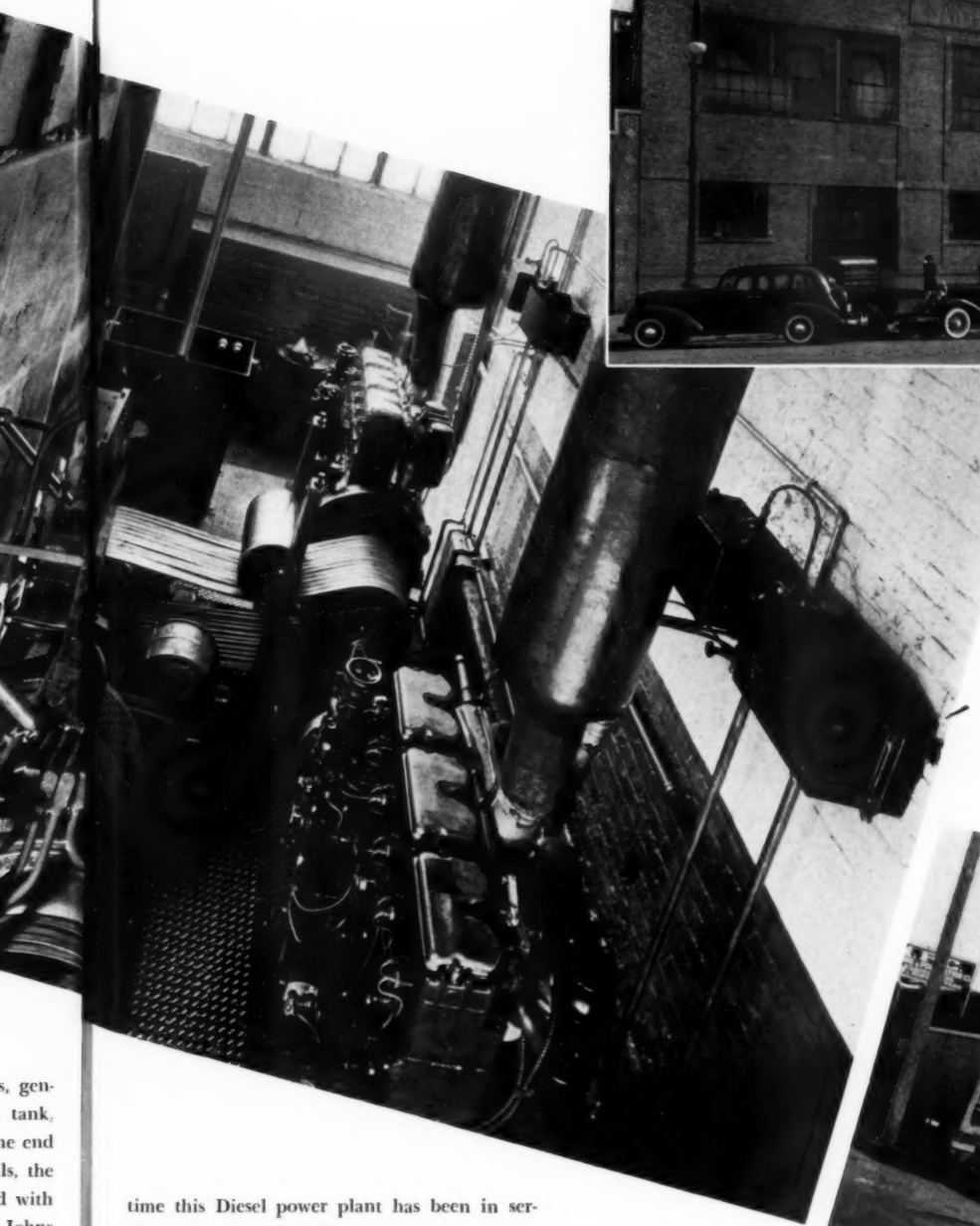
The third Cummins Diesel engine, a duplicate of the two engines described above, is installed on the second floor and is Vee belted to a 7½ in. by 7½ in. Vilter ammonia compressor. This engine is equipped with a Maxim DO4 silencer which is mounted on the roof. Handling the cooling water from all three engines is a spray type cooling tower installed on the roof by the Cooling Tower Co. A Goulds 50 gpm. 75 ft. head centrifugal pump circulates raw water from the 50 gal. makeup tank through the cooling tower. All engines are mounted on cork insulation supplied by the Vibration Eliminator Corporation.

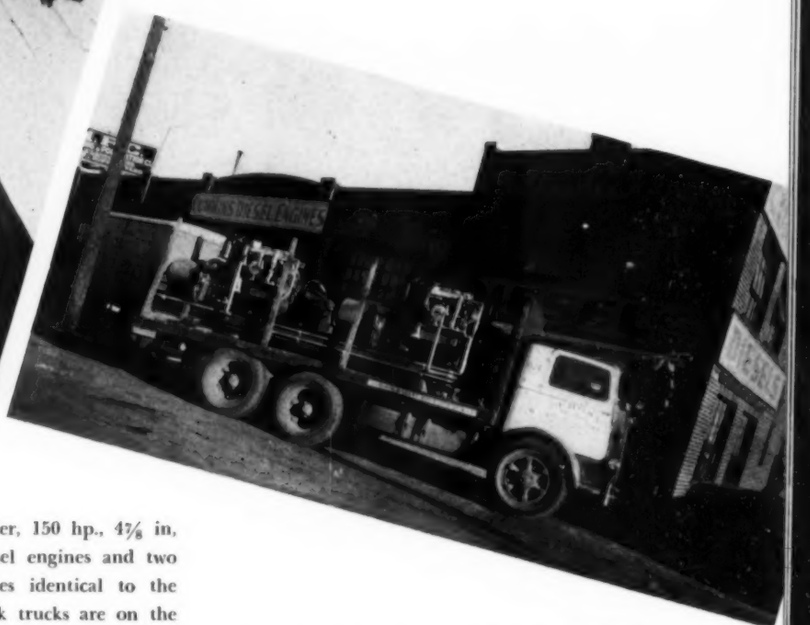
The engine room occupies a space 12 ft. by 22 ft. in a corner of the first floor. The subbase on which are mounted two engines, generators, drives and cooling water surge tank, measures 8 ft. by 18 ft. One side and one end of the engine room are the building walls, the other side and end are Transite panelled with sound absorbative backing furnished by Johns Manville.

Present engine speed settings and sheave diameters give the generating units a total continuous output rating of 100 kw. The peak summer load is 96 kw. while the load averages 45 kw. through the winter months. Engines may be speeded up and sheave diameters changed to maintain 1,200 rpm. on the generators, thereby increasing the total output to 125 kw.

Reliable and complete comparative cost data are not available at present due to the short

DIESELS





Above — The Samuel Adler plant in New York City. Left — Engine room view showing two Diesels, two generators, V-belt drives, surge tank, and switchboard, all mounted on a common structural steel subbase. Below — The entire assembly was built up in the Cummins warehouse in New York City and was moved by truck to its destination.

time this Diesel power plant has been in service. The Samuel Adler Co. is however satisfied with indicated economies to date and they have sufficient confidence in their Diesel engines to place their entire dependence on this source of power.

As an illustration of how completely Diesel engines are fulfilling the continuous power requirements of this business, let us interrupt here to mention the trucks which haul the daily supply of milk from Fort Plain, N. Y., and Herkimer, N. Y., to the Adler plant. These are five Mack trucks, powered with Cummins Model HB 600, six cylinder, 150 hp., 4⅞ in. bore by 6 in. stroke Diesel engines and two White trucks with engines identical to the above. Five of these tank trucks are on the road continuously except for loading, unloading and washout time each covering an average of 400 miles a day. Two trucks serve as alternates for regular inspection, lubrication and washing of the units. Each truck hauls 13,000 quarts of milk from 200 to 220 miles making the trip back light. This fleet is owned and operated by the M. L. Harris transportation Co. of Fultonville, N. Y., under contract with Samuel Adler, Inc.

THESE TWO DIESEL TRUCKS MAKE MONEY

By WILL H. FULLERTON

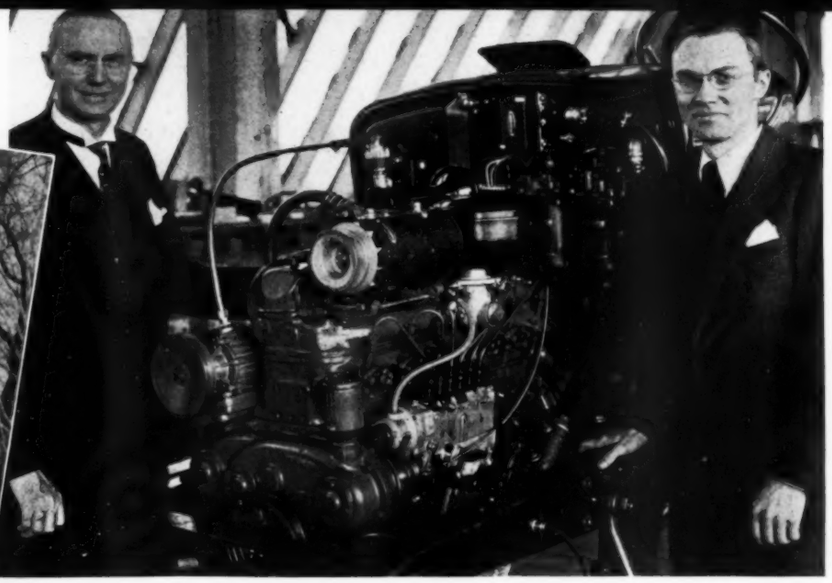
THE J. B. Carr Biscuit Company, Wilkes-Barre, Pennsylvania, is operating two Gramm-Diesel chassis, both equipped with Hercules Diesels: One long wheelbase with body and one tractor which pulls a semi-trailer. Their regular load consists of crackers and cakes. The full load capacity of crackers in the long wheelbase job is 8,500 pounds and in the semi-trailer job 12,600 pounds. When hauling cakes, it is possible to carry 14,000 pounds and 22,000 pounds respectively.

In this service, their fuel oil mileage is 10.8 mpg. in the long wheelbase chassis and 10 mpg. in the tractor trailer. This operation is largely in mountainous country. It is interesting to note that almost the same fuel mileage is being secured from the tractor trailer outfit as from the long wheelbase chassis, in spite of the fact that approximately 50 percent greater load is carried. The combination of empty tractor and trailer weighs 10,940 pounds whereas the empty straight truck and body weighs 7,000 pounds. Engine, axle, and other units are practically identical in both jobs.

A recent load of 931 dozen packages of one pound soda crackers hauled in the tractor trailer made a load of 11,172 pounds of actual crackers. As there are approximately 120 crackers to a pound, this makes 1,340,640 crackers on that load, which is a lot of crackers.

Figuring the fuel oil at six cents per gallon and approximating 10 mpg., the estimation would be $0.006 per truck mile for fuel.

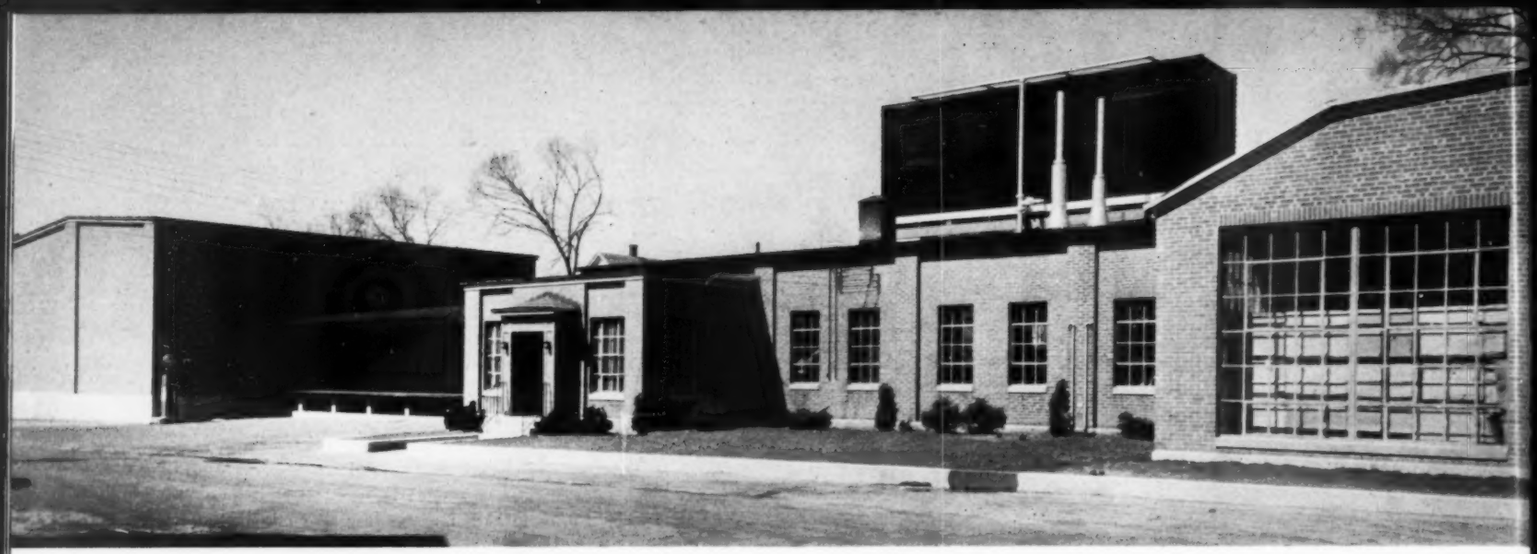
Likewise, the O.I.M. Transit Corporation of Fort Wayne, Indiana, operates a Gramm Diesel truck equipped with a DJXB Hercules Diesel



B. A. Gramm, President (left) and Willard J. Gramm, Vice-President and Chief Engineer (right) of Gramm Motor Truck Corporation, Delphos, Ohio. Mr. B. A. Gramm has been continuously manufacturing motor trucks since 1899. Engine shown is Hercules Diesel.

in conjunction with a Gramm trailer. This vehicle is operating on a run between Lima and Fort Wayne and Mr. E. Williams of the Transit Corporation states that in the several thousand miles which it has covered so far, no difficulty has been experienced whatsoever; it has caused no trouble as a result of cold weather operation despite the fact that they do not keep it in a warm garage at night when not in operation.

The load consists of general merchandise averaging twelve tons per trip. The usual consumption of fuel oil runs about twelve miles to the gallon and lubricating oil and general chassis upkeep, so far, is the same as in their other trucks operating over the same route and carrying the same load with gasoline engines. Their gasoline trucks only average five miles to the gallon of gasoline. On this basis, the O.I.M. Transit Corporations gasoline cost is one-quarter cent per cargo-ton-mile and the fuel cost only $\frac{1}{24}$ cent per cargo-ton-mile. On an average yearly mileage of 100,000, carrying twelve tons with a trailer, the saving would be approximately $2,500 with fuel oil at 6 cents and gasoline at 15 cents – no fuel taxes are included in either case.



General view of Torrington Ice Company plant showing large Binks cooling tower and two Maxim silencers mounted on the roof.

DIESELIZED ICE PLANT AT TORRINGTON, CONN.

By WILBUR W. YOUNG

IN 1933, the Stevens Pure Ice Company, headed by Samuel H. Stevens of Torrington, Connecticut, built a small plant to make ice for distribution by the Torrington Ice Company. Chicago Pneumatic Tool Company installed in this plant the first of its Type R. H. Diesel engines, a 4-cylinder 4-cycle 147 hp. unit, to drive a Carbondale ammonia compressor. The success of this enterprise, to which Diesel economy contributed much, resulted in Mr. Stevens' taking over the Torrington Ice Company in 1937, at which time he enlarged the plant to its present 50-ton capacity.

The R. H. engine was replaced by a new Chicago Pneumatic Model 48 C. P. 4-cylinder 4-cycle 120 hp. Diesel engine, operating at 600 rpm. late in 1937. In October, 1938, a duplicate of this engine and all equipment described below was installed. A 2:1 Morse Chain step-up drive connects an Electric Machinery Mfg. Co. 25 kw. generator, operating at 1,200 rpm., to one end of the engine, while a 9 in. by 9 in. Carbondale compressor is driven off the other end through a Farrel-Birmingham 2:1 reduction gear with Thomas D.S.A. flexible couplings on both high and low speed sides of the gear. An open jacket cooling system is tied in with the ammonia condenser cooling water supply. A Demming deep well pump supplies make-up water to a collection tank sunk in the engine room floor from which the cooling water is circulated by a Dayton-Dowd centrifugal pump. A large Binks cooling tower mounted on the roof handles the engine and refrigeration cooling. Jacket water temperature is indicated by U. S. Gauge thermometers in the cooling system at each cylinder outlet.

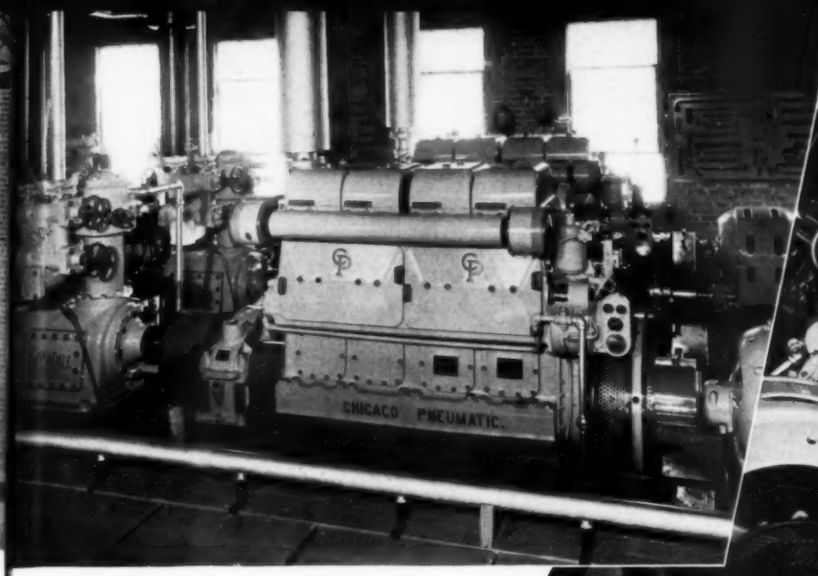
Each Diesel engine is equipped with identical accessories including Harrison Model 16-3 lube oil coolers, Cuno Auto-Klean lube oil filters, Nugent fuel oil filters, Pickering governors, one of which is equipped with a push button controlled mechanical load balancer. Combustion air is taken in at both ends of the intake manifold through two Burgess cleaners and silencers. The engines exhaust through two Maxim DO4 Size 6 vertical silencers extending through the roof. The exhaust silencers are heavily coated with aluminum paint which enhances their appearance and protects them from the cooling tower spray. A motor-driven Quincy air compressor maintains 300 lb. pressure on two air storage tanks which provide sufficient air for several engine startings.

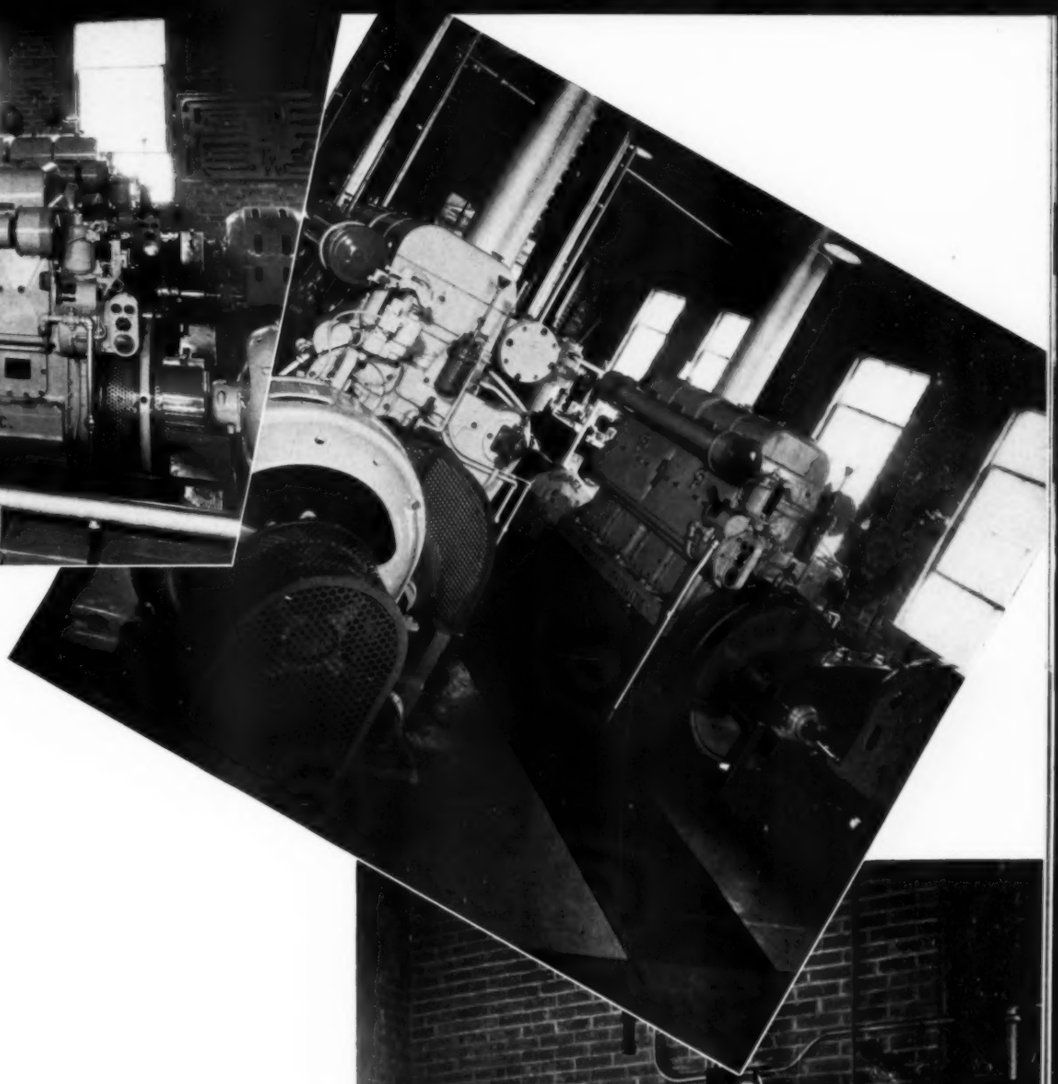
An Electric Machinery Mfg. Co. switchboard carries Weston ammeters, voltmeters, push button load balancing station, distributing switches, and a double circuit Alnor 4-point pyrometer which indicates individual cylinder exhaust temperature for either engine.

It is interesting to note that this plant is surrounded by residences. The Diesel engine exhaust is audible as a soft puff across the street with no far-carrying low frequencies. The Diesel engines are bolted directly to a concrete slab extending six feet down to bed-rock. Vibration, both within and without the plant, is noticeable by its absence.

A description of this plant would be quite incomplete without mention of its eye-appeal. The Diesel engines, generators, ammonia compressors, and all accessories glisten with two coats of light orange NuEnamel, trimmed in vermilion, while the floor and piping present a pleasing, as well as practical contrast, in battleship gray. In fact, the entire plant suggests a clean-cutness of planning and operation which may account for its steady growth and success through depression years and increasing competition.

The Diesel power plant supplies electrical energy for lights and numerous motors driving deep well and circulating water pumps, the ice scoring, cubing, and crushing machines, a 5-ton Shepard ice crane, and air compressor. In addition, the ammonia compressors, driven by

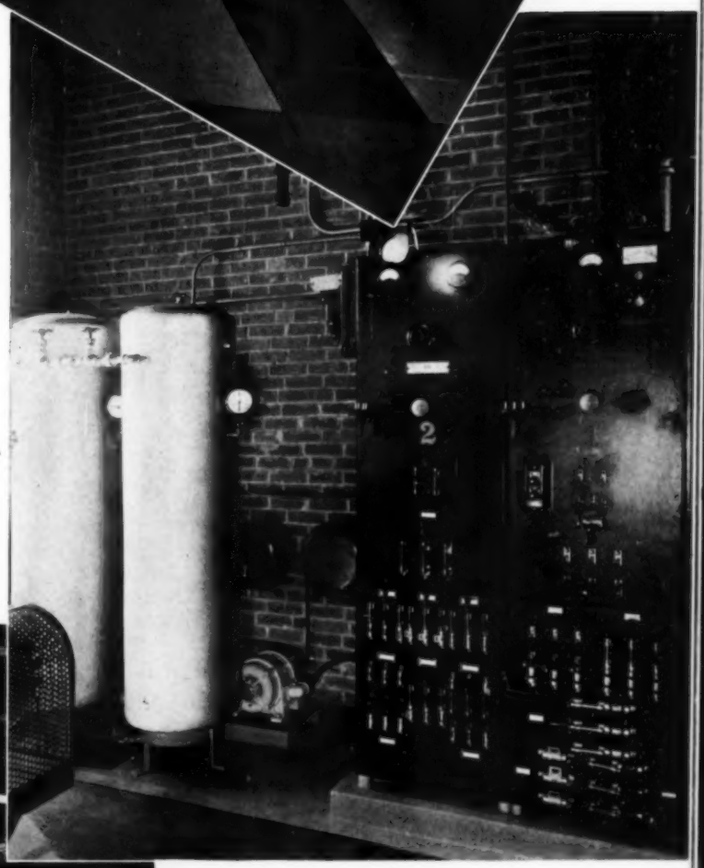




Above — Side view of engine showing operating station, dual Burgess intake silencers and cleaners, generator drive from one end and ammonia compressor drive from the other end. Right — End view of both engines showing Nugent fuel oil filters.

the Diesels, refrigerate the ice-making units capable of producing 50 tons of ice per day, besides maintaining a temperature of 22° F. in an ice storage room of 1,200 tons capacity and a smaller combination storage and workroom of 350 tons capacity. Standby connection with the utility company is maintained for emergency and off-time lighting only.

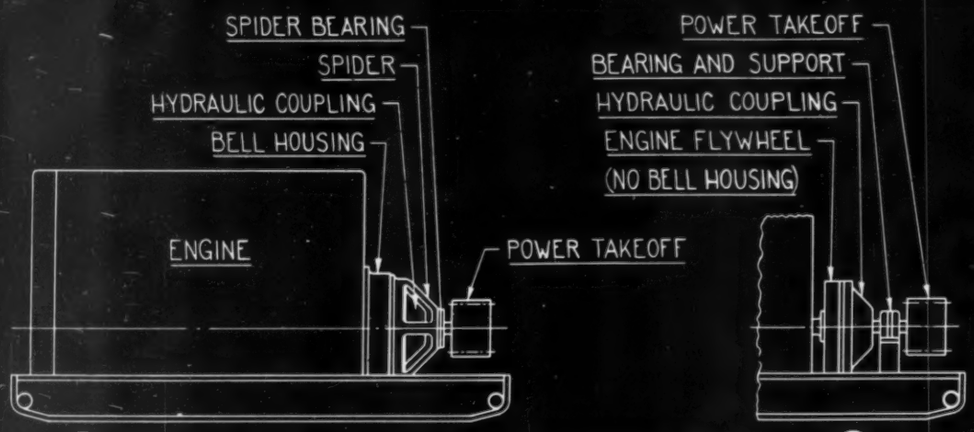
A number of spot checks on fuel consumption taken through the year and a half which one Diesel has been operating, also including the six months the second Diesel has been in service, shows an average of 110 gal. to 40 tons of ice produced. A fine record of economy for the engines and for Torrington Ice Company.



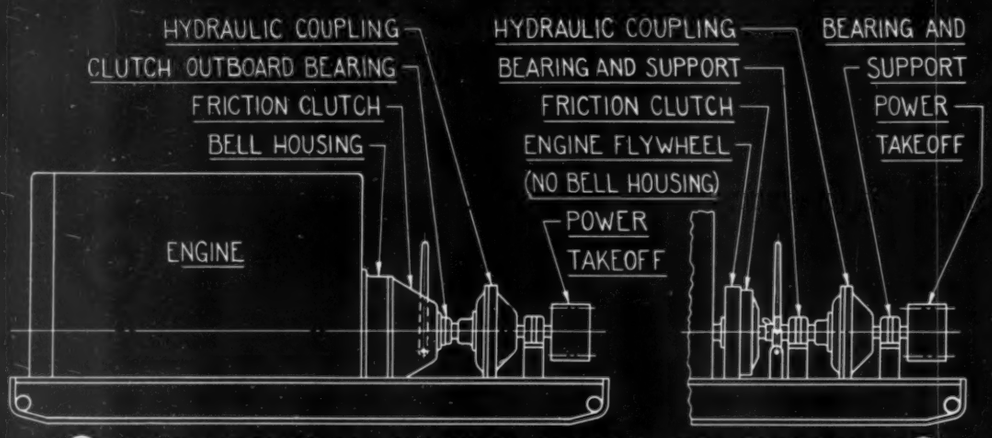
Right — View of switchboard showing Alnor pyrometer in the upper right-hand corner. Below — General interior view of Torrington Ice Company plant.

INSTALLATION ARRANGEMENTS

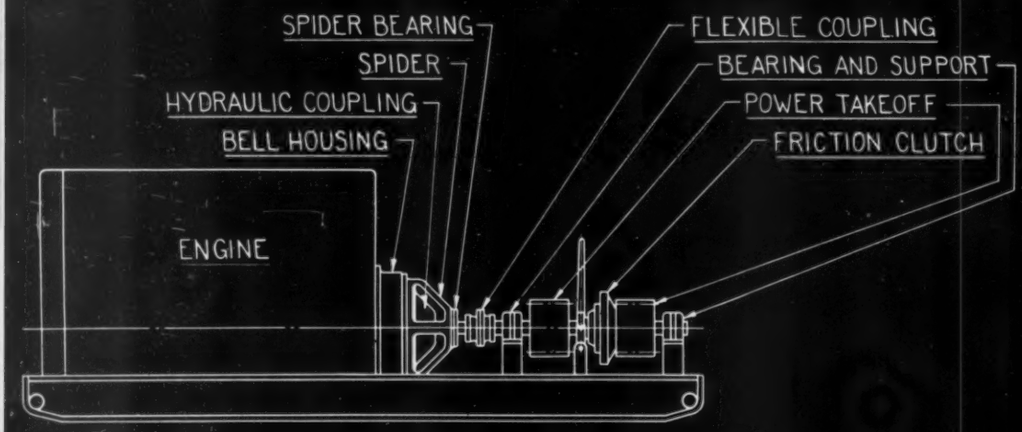
THE FOLLOWING ARRANGEMENTS ARE SUGGESTED FOR THE APPLICATION OF HYDRAULIC COUPLINGS TO VARIOUS TYPES OF DRILLING RIGS.



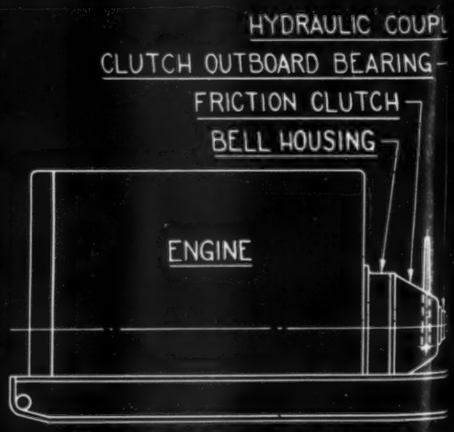
① HYDRAULIC COUPLING MOUNTED ON ENGINE FLYWHEEL. POWER TAKEOFF THROUGH GEAR, CHAIN, OR PULLEY. ⑴A



② HYDRAULIC COUPLING MOUNTED ON ENGINE CLUTCH STUB SHAFT. ⑵A POWER TAKEOFF THROUGH GEAR, CHAIN, OR PULLEY.



③ HYDRAULIC COUPLING MOUNTED ON ENGINE FLYWHEEL. POWER TAKEOFF THROUGH GEAR, CHAIN, OR PULLEY.



④ HYDRAULIC COUPLING MOUNT
POWER TAKEOFF THROUGH GE

FLUID DRIVE OR

OUR readers will be somewhat familiar with the hydraulic coupling in its application to Diesels for marine service, because in earlier issues the coupling has been described briefly in connection with equipment on new vessels. The steady increase in that branch of application leads us to believe that this method of connecting and disconnecting the Diesel marine engine and the driven gears and shafting is generally accepted.

The hydraulic coupling is, however, definitely not confined to the marine field for its application. In power transmission for the industrial field, its use has become wide-spread and interest in its application has become general. One of the most interesting of the uses of the traction coupling is in its application in oil fields on oil field machinery. The traction coupling is a constant speed machine as differentiated from the scoop tube coupling which obtains variable speed from a constant speed driver. Therefore, the traction coupling will be, in most cases, the proper fluid drive from a Diesel engine under throttle control; incidental to its use under throttled control is its ability to do valuable things to a Diesel engine under governed or idling speeds, under load and under no loads, and with high overloads. The attached black and white prints show the possible applications of the drive to various kinds of driven equipment in the oil field.

When used with an internal combustion engine, the traction coupling provides a perfectly smooth take-up of loads which is obtained simply by accelerating the engine which is thus allowed to pick up the load gradually while running. Since the power is transmitted by the kinetic energy of the oil circulating within the working circuit, it is not possible for torsional vibration or shock loads to be trans-

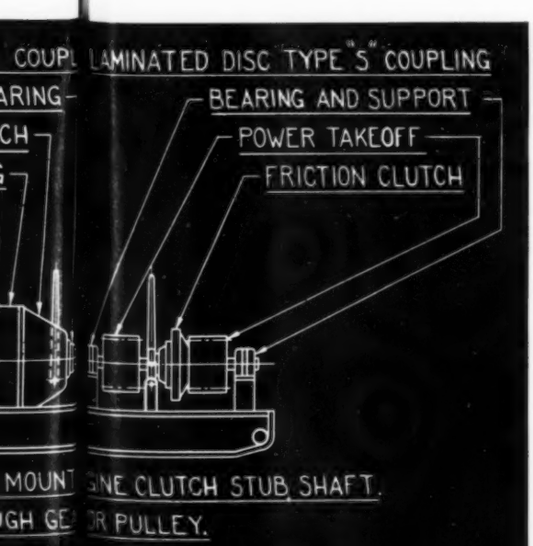
IVE OR DRILL RIGS

mitted from the engines to the driven machinery. The fluid coupling acts as a very good cushioning medium. It can be made impossible to stall the engine regardless of the amount of overload. This is possible because the driven shaft can be made to stall under full torque while the engine continues to run at a somewhat reduced speed. There is almost a complete absence of frictional wearing parts within a fluid coupling. This coupled with its value as a shock absorber reduces wear and tear and maintenance on the entire engine and transmission. Additional advantages are as follows:

1. Providing exceptionally soft drive for fishing operations.
2. Saves friction clutches by taking slip in fluid drive.
3. Saves chain drives by providing unlimited flexibility.
4. Fluid drive allows engine to be run under full throttle with mud pump stalled.
5. Prevents transmission of vibration caused by engine explosion.
6. Equalizes load on compounded engines at slightly different speeds.
7. Permits running engine to top speed and dropping in clutches to pick up heavy loads or stuck pipes.

There is no mechanical connection between the driving member, connected to the power source, and the driven member connected to load. With the fluid drive containing a light turbine oil, the engine whirls the driving member with its radial vanes forcing the oil outward against the vanes of the driven member.

For further details write Hydraulic Coupling Division of American Blower Company, 50 W. 40th Street, New York, and ask for Bulletin No. 3519.



NEW PROTECTOMOTOR AIR FILTER

EMBODYING all the well-known Protectomotor principles, this newly designed dry-type air filter manufactured by Staynew Filter Corp. for small internal combustion engines, compressors, pumps and all "air-breathing" machines offers important economies, particularly in volume purchases.

As shown in the accompanying illustration, the Protectomotor Model E is amply protected against all weather conditions by the heavily enameled steel housing opening at the bottom. This steel housing, of simple pressed metal construction, is less expensive than the aluminum louvred shell of the former Model C Protectomotor which it supersedes. At the same time, the new Model E possesses every advantage of its justly famous predecessor, hundreds of thousands of which are in use throughout the world.

In the cut-away illustration, "A" indicates the exclusive, patented Radial Fin Construction which provides the largest possible filtering area in the smallest possible space. This, of course, means free air flow and long periods of operation without cleaning. The Radial Fin Construction is the best ever devised to resist pulsating intake.

The dry Feltex Filtering Medium, also an exclusive Protectomotor feature, is indicated by "B". Feltex is a felt-like material of extreme fineness, which permits free air flow, yet holds back the smallest particles of air-borne matter. With Feltex, there is no possibility of harmful material from the medium being sucked into the engine under the hardest possible vacuum. The filtering action is positive—there is no variation whatever in the fineness of the medium. Tests made by the University of California show that Protectomotors in the Radial Fin Construction, equipped with Feltex, prevent the passage of 99.9 per cent of all air-borne matter.

At "C" is shown the intake, approximately double the outlet area, thus keeping friction and turbulence of the entering air at a minimum.

The weatherproof housing is shown as "D" and "D1".

Note the heavy wire mesh backing of the filter insert at "E," and the Yoke, "F," both of which add to the rigid, vibration-resistant qualities of this filter. The yoke and the bolt supporting the upper shell are both spot welded.

The upper shell, "D," may be quickly removed and the insert lifted out for cleaning by merely unscrewing the top wing-nut. A threaded flange, "G," is provided by means of which the entire unit may be easily removed or installed. Both upright and hanging models are available in capacities ranging from 3 cfm. to 225 cfm. and in a wide selection of standard pipe sizes.

NEW HOIST PLUGS INTO ORDINARY LAMP SOCKET

COMBINING the dependability of big scale hoisting equipment with compact, lightweight convenience — this is what CM engineering has achieved in the new Comet Hoist. Easily carried and installed by one man, the Comet is powered by a specially built heavy, duty, high torque motor that runs on an ordinary light circuit or 3 phase power line. Just plug in, and the hoist is ready to go. No special installation or accessories needed. Use it anywhere.

The result is a new idea in materials handling — a rugged versatile tool that saves time and energy on smaller type hoisting operations where heavy equipment is too costly and impractical.

The compact design and ease of operation make the Comet especially valuable for service on production lines in large plants. Yet, the price is low enough to make it ideal equipment for the smallest shop.

The construction of the Comet is compact and rugged, yet exceptionally light in weight. Precision ball bearings are provided at each rotating point. Gears are precision machined of heat-treated alloy steel. Controller, with patented "delayed reversing" feature, operates easily with one hand and affords an extremely sensitive control for lifting the load distances of a fraction of an inch.

The Comet is offered in four capacities: 250, 750 and 1,000 lbs., and several speeds. The 500, 750 and 1,00 lbs., and several speeds. The tion and operating details are fully illustrated in literature available by writing the Chisholm-Moore Hoist Corporation, 368 Fremont Ave., Tonawanda, N. Y.

ALARM CONTROL SYSTEMS

ADAPTED for Gas and Diesel engine installations, "Genuine Detroit" No. 250 control switches are widely used as alarm controls on lube oil pressure and jacket water temperature. The No. 250 Series are line voltage switches designed for use as pressure or temperature limit devices usually closing a warning light circuit or a horn or bell alarm circuit. Fig. 1 shows the switch with cover removed; the actuating bellows at the bottom, the operating range adjustment at the right, and the differential adjustment at the top.

For pressure control, several models are offered ranging from 0 to 160 lbs. with adjustable differential ranging from 1½ lbs. minimum to 3 lbs. maximum. These models are designed for maximum momentary pressures from 25 lbs. to 200 lbs. The operating range and differential are adjustable. Depending on the type of operation desired, the switch will make or break the circuit on pressure increase and vice versa. The double throw type is available which will make the circuit on both increase and decrease of pressure. All pressure control models are arranged for direct connection in the oil pressure line.

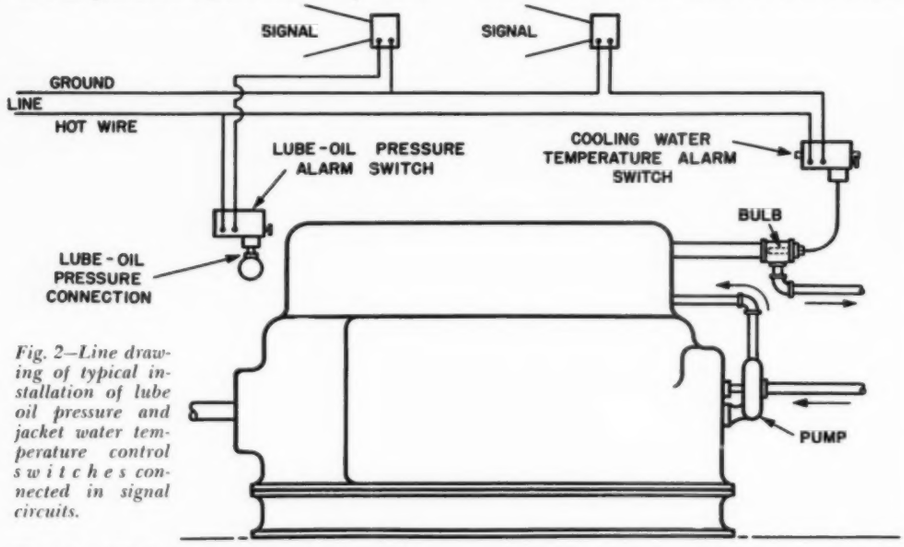


Fig. 2—Line drawing of typical installation of lube oil pressure and jacket water temperature control switches connected in signal circuits.

For jacket water temperature control the switch may be either directly or remotely connected to the water line. Like the pressure switches, both the temperature range and operating differential are adjustable. Models are available with temperature ranges from 0 to 60 degrees up as high as 380 to 495 degrees. These switches are sensitive to temperature differentials of 1 to 1½ degrees.

Fig. 1. "Genuine Detroit" control switch with cover removed.

Installation of both pressure and temperature alarm control switches, as shown in Fig. 2, is simple. The switches are arranged for direct insertion in the oil and water lines and are connected in 110 volt or 220 volt signal circuits.

WILKINSON TO EUROPE

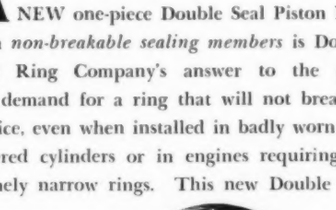
MR. PAUL H. WILKINSON, the aviation editor of DIESEL PROGRESS, is leaving for Europe early in May to visit the various aviation centers in France, Germany and Great Britain. There he will be able to obtain first-hand information regarding the latest developments with the Diesel aircraft engine and the types of airplanes in which it is being flown. The aviation article which will appear in the June issue of this magazine, will be sent in from Paris, and there will be succeeding articles from Berlin and London. On his return, Mr. Wilkinson will resume his specialized consulting work in the field of the Diesel aircraft engine.

NEW POWER PLANT FOR CLINTON, MICHIGAN

THE Cooper-Bessemer Corporation has recently received an order for two of its Type LT Diesel engine generating units from the Village of Clinton, Michigan, to be installed in the new municipal power plant being erected there with PWA aid. The two units will consist of seven-cylinder Cooper-Bessemer Diesels, rated 730 hp. at 257 rpm., driving Ideal Electric Company, 630 kva. generators and V-belt-driven, 15 kw. exciters. Engineers in charge of the project are Fargo Engineering Company of Jackson, Michigan.

NEW ONE-PIECE DOUBLE SEAL PISTON RING

A NEW one-piece Double Seal Piston Ring with *non-breakable sealing members* is Double Seal Ring Company's answer to the present demand for a ring that will not break in service, even when installed in badly worn and tapered cylinders or in engines requiring extremely narrow rings. This new Double Seal



ring retains all the well known advantages of the regular Double Seal Ring—plus the advantage of the new non-breakable sealing member. The manufacturer guarantees this improved ring to give more efficient service and have longer life than other piston ring available, either plain or sealing type. Requests for literature are welcome.

DRAVO CORPORATION REPRESENTS KORFUND

THE Korfund Company, Inc., of Long Island City, New York, takes pleasure in announcing that sales, service and installation of Korfund Anti-Vibration Products in the Western Pennsylvania Territory is now handled exclusively by the Dravo Corporation of Pittsburgh, Pennsylvania.

This well-known organization with its outstanding record of engineering achievement is particularly well adapted to serve this territory which comprises Western Pennsylvania, West Virginia and the "steel district" of Ohio. The wide-spread use of resilient mounting of machinery to isolate vibration transmission is responsible for this latest addition to the varied activities of the Dravo Corporation.

A USEFUL CATALOG

THE Lovejoy Flexible Coupling Co., 5009 West Lake Street, Chicago, Illinois, has recently produced a new catalog describing the L-R Flexible Couplings. Copy of this catalog may be obtained by writing direct to the Company and we recommend to our readers that they obtain a copy. It is full of very useful information on the application of flexible couplings to Diesel engine drives.

DAVID DASSO RESIGNS

EFFECTIVE April 1, 1939, Mr. David Dasso is resigning his position as vice-president of the American Locomotive Company, Diesel Engine Division. He will be retained in a consulting capactiy by the Locomotive Company and will also continue in the position of U. S. Representative of Sulzer Brothers, Ltd., of Winterthur, Switzerland.

DIESEL PROGRESS

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ANN ARBOR MEETING

THE Oil and Gas Power Division of the American Society of Mechanical Engineers will hold their annual meeting this year at Ann Arbor, Michigan, June 19 to 22.

The meeting room, accessory exhibits, and living quarters will all be located in the Michigan Union Building situated, of course, on the campus of the University of Michigan. Room rates will run from $2.50 to $4 single, and $5 to $6 double, European plan. Reservations should be sent to the attention of Professor C. W. Good, University of Michigan, Ann Arbor, Michigan.

Under the able guidance of Lee Schneitter, an excellent group of papers has been gathered together and the highlights of the program are as follows: Mr. A. K. Bruce of London will give a paper on Oil and Gas Engine Practice in Great Britain on Monday, June 19. Monsieur M. Bochet of Paris will give a Resume of European Design of Internal-Combustion Engines. Mr. C. G. A. Rosen and Mr. C. R. Maxwell of the Caterpillar Tractor Company will give a paper on High-Speed Diesel Engine Development in the U. S.

There will be a symposium on piston ring troubles on Tuesday, June 20, with a discussion by a representative of the Double Seal Ring Company, the American Hammered Piston Ring Company, Cooktite Ring Sales Company, and the Sealed Power Corporation. On Wednesday, June 21, lubricating oil problems will be discussed in detail and Wednesday night the annual banquet will be held. On Thursday, June 22, papers on exhaust problems, on combustion problems, and on injection problems will be read. All in all a very interesting and comprehensive program. Copies of the complete program may be obtained from M. J. Reed, 2 West 45th Street, New York City.

COOPER-BESSEMER CHANGES

SEVERAL important changes have occurred recently in the Cooper-Bessemer organization: C. B. Jahnke, general manager, has been elected vice-president and a director. W. C. Heath, president of the A. O. Smith Corporation of Milwaukee, has been elected a director and the board of directors has been increased from eleven to thirteen.

Paul A. Condit

Ralph Boyer has been moved up to chief engineer in charge of Diesel production. Paul A. Condit has joined the organization in the capacity of control engineer. Previously Mr. Condit had been associated with the Mason-Neilan Regulator Company as a development engineer.

ROCK ISLAND BUYS TWO

THE management of the Rock Island Lines has announced the awarding of contracts for building two new streamline Rocket trains to cost $1,200,000 which will be placed in operation between Chicago and Denver-Colorado Springs. Each of the trains will contain seven cars and a 2,000 hp. General Motors Diesel locomotive.

With the delivery of these two new streamline trains, the Rock Island will have in service a total of eight Rockets. The other six trains in operation since 1937, are daylight trains and carry no sleeping car equipment.